THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

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BY
OXIDE OF IRON.

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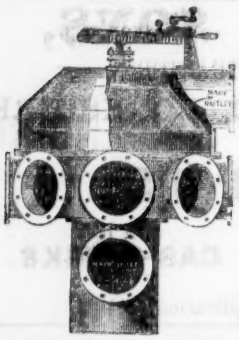
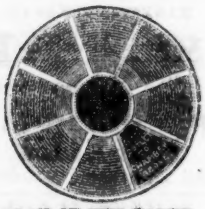
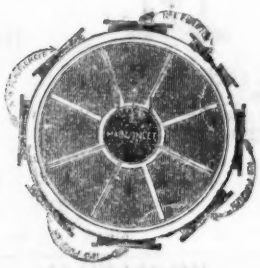


ELEVATION OF THE CENTRE-VALVE.



PLAN OF THE VALVE.



PLAN OF THE BODY.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers on the system of three in action, and one out of action. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A considerable improvement and saving is effected in the cost of the connecting-pipes.

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[*As Illustrated and Described in the* JOURNAL *for May* 4.]

Communications to be addressed to

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NO MORE WASTE LIME! SAVE THE VALUABLE PRODUCT!

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Most Effectively and Economically restores this waste *ad infinitum*.

The Patentee having devoted more time and attention to this subject than perhaps any other person living, is now in a position to recommend the adoption of this process to Gas Companies and Corporations with the utmost confidence in its practical utility, convenience, and economy. 1st. It restores the spent Lime at from one-third to one-half its original cost, apart from its undoubted convenience and the economy of space. 2nd. There is practically no limit to the duration of the Lime. 3rd. The cost of apparatus for the introduction of the process is very moderate and exceedingly durable. 4. The Patentee supplies special bricks and castings, erects and proves the process on the most favourable terms.

The process, in operation, may be seen at the Corporation Gas-Works, Paisley, where the Lime has been restored 120 times. Inspection is cordially invited.

For Terms, apply to GEO. R. HISLOP, F.C.S., Engineer, Gas-Works, PAISLEY, N.B.

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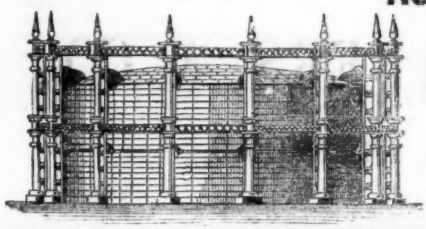

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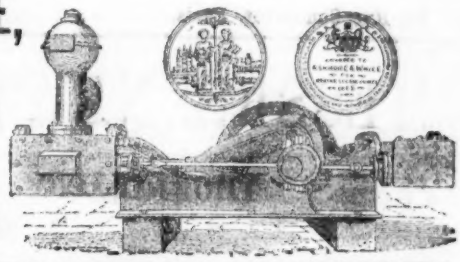

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NEW GAS-WORKS erected complete. Plans and Estimates furnished. MAINS, METERS, SERVICES, LAMPS, &c., adapted for Towns of any size. Gas Companies advised on Improvements, Extensions, and Alterations of Works.

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They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

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An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS. MEDIÆVAL FITTINGS for CHURCHES, &c.

PATTERN-BOOKS and PRICE LISTS furnished.

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The Comptoir Général of Gas and Water Works is authorized by a leading Company to **Buy Gas and Water Works and Concessions.**

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And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.

WEST'S GAS IMPROVEMENT COMPANY.
LIMITED,

ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

CHARGING AND DRAWING GAS-RETORTS,

And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

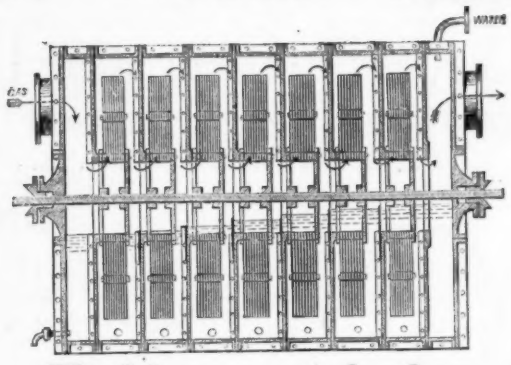
The advantages attending its use are—

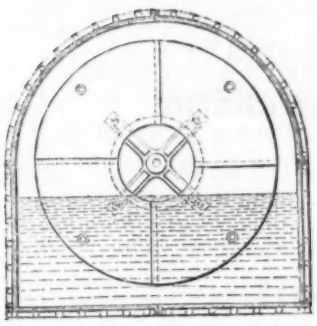
INCREASED VOLUME OF GAS PER TON.—INCREASED YIELD PER RETORT.—INCREASED BULK OF COKE FOR SALE.—REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.

A Pamphlet containing a description of the Machinery, and Copies of Reports on the working of the same, &c., will be forwarded on application to the MANAGING DIRECTOR, Maidstone. Communications may also be addressed to the Consulting Engineer, R. P. SPICE, Esq., M. Inst. C.E., 21, Parliament Street, London, S.W., or to the Engineer and Analyst, F. W. HARTLEY, Esq., A. Inst. C.E., 55, Millbank Street, London, S.W.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

PATENT "STANDARD" WASHER-SCRUBBER COMPANY.





These Machines contain from 3200 feet to 65,000 feet of Wetted Surface.

The Special Merits of this Washer are as follows:—That it is not necessary to reduce the temperature of the gas to 60°, or thereabouts, to make it effective; **and that as no tar is retained in it, the illuminating power is not reduced as in Tower Scrubbers.** That the distribution of the liquor is made with unerring regularity. That it occupies very small space, so that it can be, at little expense, effectually protected from extreme changes of the weather. That the considerable expense of Coke or Wood, or other Scrubbing Material, is entirely saved, and that the great nuisance and cost of from time to time replacing the Scrubbing Material is avoided. That, by the revolution of the discs, the quantity of water carried up by them, and tending continuously to fall, exposes a very large amount of fresh wetted surface to contact with the gas as it ascends. That it is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured. That it is much cheaper than any other Scrubber that will do the same amount of work effectually. That it is the only Washer suitable for purifying Gas from all its impurities by solution. That it works with a minimum of pressure. That it takes out every trace of Ammonia from the Gas in once traversing the machine, as well as a very large quantity of carbonic acid and sulphuretted hydrogen. That it requires very little outlay for foundations.

The following Testimonials show the opinion of eminent Engineers as to the capabilities of the Washer:—

Messrs. KIRKHAM and HERSEY. *The Gaslight and Coke Company, Beckton, North Woolwich, June* 8, 1880.

Gentlemen,—I enclose you some particulars of the working of your Washers here, and I intend having some more experiments made, as just now we are working the first Washer with liquor and the second with water. Of course the fact of our having ordered two more, in addition to the four which we have in use, is a sufficient indication of my opinion of the value of the Washer.

(Signed) G. C. TREWBY.

Messrs. KIRKHAM AND HERSEY. *South Metropolitan (late Phœnix) Gaslight Company, Engineer's Office, June* 19, 1880.

Dear Sirs,—The "Standard" Washer which you supplied for use at our Vauxhall station has afforded me entire satisfaction. It was designed to remove the ammonia from 3 million cubic feet of gas per day, and during the past winter it did so with a good working margin to spare. It is as excellent now in workmanship as in design, and is well worthy of the general acceptance with which it appears to be meeting.

I am, faithfully yours, (Signed) CORBET WOODALL.

Messrs. KIRKHAM, HULETT, and CHANDLER. *The Gaslight and Coke Company, York Road, King's Cross, Jan.* 14, 1879.

Gentlemen,—In reply to your inquiry, I am pleased to say the Washer which was put in action at this station in October last has quite fulfilled my expectations, as it confirms the experiments I made in May last with the smaller machine. Working at four revolutions per minute, **it takes out every particle of Ammonia,** while purifying more Gas than it was intended to do. I enclose particulars of a week's working during our heaviest make, by which you will see that it yields the full quantity and strength of liquor, and works with little pressure. I am therefore quite satisfied with the machine, and trust it may meet with the success it deserves.—I remain, &c., (Signed) JOHN CLARK, Engineer.

The following Table shows the results of the working of one of these Washers, lately erected to purify 60,000 *feet of Gas per Hour, at the St. Pancras Station of The Gaslight and Coke Company:—*

1879.	Nos. of the Divisions and Strength of Liquor in each.										Water used per Ton of Coals.	Gas Purified per Hour, Cubic Feet.	Ammonia on Outlet.	Temperature.			Pressures.		Revolutions per Minute.
	1	2	3	4	5	6	7	8	9	10				Inlet.	Outlet.	Atmosphere.	Inlet, Inches.	Outlet, Inches.	
	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.									
January 7	11	9	7	5½	3½	3	1⅝	1½	½	0	10 Gallons.	59,000	Nil.	74°	66°	31°	25	23½	5
,, 8	9½	7½	6	4½	3	2	1	¾		0	10 ,,	73,000	Nil.	73°	61°	31°	28	26½	4½
,, 9	11	9	7	5	3½	2½	1½	1	½	0	10 ,,	82,000	Nil.	74°	67°	33°	27½	25½	5
,, 10	10½	8½	6¾	5	3½	2½	1½	1	½	0	10 ,,	66,000	Nil.	76°	64°	28°	28½	27	5
,, 11	12½	10	7¾	5¾	4½	3½	1⅝	1¼	½	0	10 ,,	61,000	Nil.	75°	64°	27°	26½	25½	5
,, 12	11	8¾	6¾	—	—	—	1¼	¾	½	0	10 ,,	39,000	Nil.	74°	64°	27°	26½	25½	5
,, 13	15	10¾	8½	6	4¾	3½	2	1½	¾	0	10 ,,	78,000	Nil.	73°	65°	42°	28	26	5

Messrs. KIRKHAM, HULETT, and CHANDLER. *Corporation of Birmingham, Gas Department, Saltley Works, May* 23, 1879.

Gentlemen,—I beg to enclose you a copy of the results of the tests which, by the kind permission of the Engineer, Mr. Clark, I made on the 6th of March last, of the working of one of your "Standard" Washers and Scrubbers at the St. Pancras Station of The Gaslight and Coke Company, and I am of opinion that, for an apparatus occupying so small a space, they are exceedingly satisfactory.—Yours truly, HENRY HACK, Engineer.

Working Results obtained from KIRKHAM, HULETT, *and* CHANDLER'S *Patent "Standard" Washer and Scrubber at the St. Pancras Station of The Gaslight and Coke Company, London, March* 6, 1879.

Gas passing per Hour, Cubic Feet.	—	Impurities in Gas per 100 Cubic Feet.			Temperature.		Pressure in Inches.	Revolution of Apparatus per Minute.	—	No. of Divisions and Strength of Liquor.										Water Used during Experiment. Gallons.
		SH_2	CO_2.	Grains. NH_3.	Washer.	Air.				10	9	8	7	6	5	4	3	2	1	
64,000	Inlet	2·00	2·00	158·8	72	57	21	4½	Twaddel deg. at 60°	5·3	4·9	2·85	2·35	1·7	1·05	0·6	0·3	0·15	0·1	63
	Outlet	1·50	1·50	0·8	68	57	20		Acid, ounces.	11·0	8·4	6·3	4·5	2·7	1·7	1·3	0·7	0·3	—	

Messrs. KIRKHAM and HERSEY. *The Leeds Corporation Gas-Works, Meadow Lane, Aug.* 14, 1879.

Gentlemen,—In reply to your inquiry of yesterday's date, I have pleasure in stating that the item appearing as income derivable from Ammonia in my estimate of revenue for current year is not an exaggeration. Our average income from Ammonia is 2s. 8d. per ton of coals carbonized, but at the works where your invention is in use we derive not less than 3s. per ton. Since the introduction of efficient Scrubbers at our works the greater yield of this product (now twice as valuable as coke to us) is such that the cost of Apparatus for its extraction can be wholly paid for out of from nine to twelve months gains. I am, Gentlemen, yours faithfully, (Signed) H. WOODALL, Engineer.

Messrs. KIRKHAM and HERSEY. *Heywood Local Board Gas-Works, Hooley Bridge, Heywood, Dec.* 1, 1879.

Gentlemen,—In reply to your favour of the 28th ult., I beg to state that the Scrubber is at work, and doing well. I shall be glad to show it to any inquirers.—Yours truly, (Signed) EDWIN BUCKLEY, Engineer.

For further particulars and testimonials, address Messrs.

KIRKHAM, HULETT, & CHANDLER, LIMITED, { 59 & 60, Palace Chambers, Bridge St. Westminster, London, S.W.

C. & W. WALKER'S
WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

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ESTABLISHED IN 1860.

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FOR
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Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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AND
WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

GEORGE'S
Patent Gas Calorigen,
A STOVE FOR
WARMING AND VENTILATING.
RECOMMENDED BY DR. RICHARDSON.

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J. F. FARWIG & CO.,
36, QUEEN STREET, CANNON ST., LONDON.

ERECTION of CHEMICAL PLANT.

SULPHATE OF AMMONIA APPARATUS.
CONTINUOUS METHOD.
Improved "Coffey Still" Process and other Methods.

Apparatus for Making Gray or White Sulphate of Ammonia from Nitrogenous Bodies.

Models of above plant supplied, price £3 10s. and £5 10s., or plans at moderate rates. Assistance given to persons making experiments.

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FILES OF BEST QUALITY
FOR ENGINEERS,
STEEL OF ALL DESCRIPTIONS,
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ANVILS, VICES,
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No Offensive Smell.
Light and Warmth combined.
Cost less than other Fuel.

Messrs. RITCHIE & Co. are prepared to supply these Stoves on the best possible terms to Gas Companies to let out to their Consumers on the hire system.

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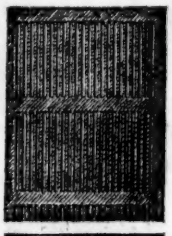
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On our approved principle, for the extraction of Ammonia.
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GLOBE METER-WORKS, OLDHAM,
MANUFACTURERS OF
WET & DRY CONSUMERS GAS-METERS,
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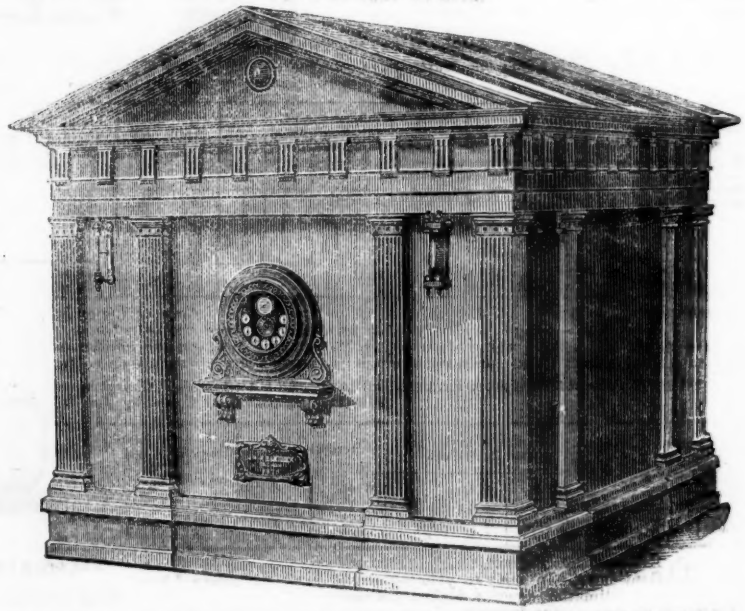

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WITH PLANED JOINTS.
GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.
GAS COOKING APPARATUS.
Home and Foreign Orders promptly attended to.
All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.
Orders almost invariably despatched on the day of receipt.
TERMS, &c., ON APPLICATION.

TANGYE BROTHERS AND HOLMAN,

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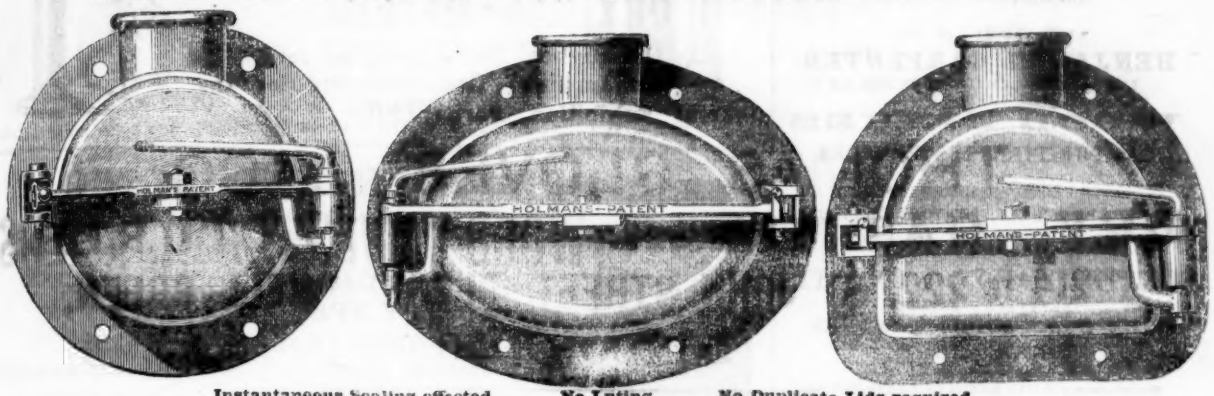
SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and Self-Sustaining Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

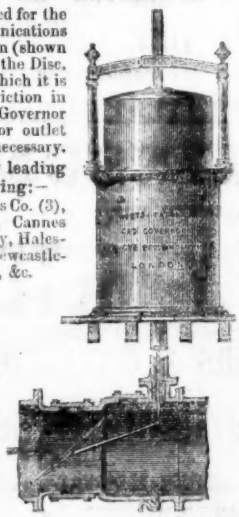
Morton's Patent Retort-Lids are in use in nearly all the Principal Gas-Works in the United Kingdom and the Colonies; also on the Continent and in the United States of America. They are now made of the

SAME FORM OR SECTION AS THE RETORT. (See Illustrations above.)

Engineers preparing Specifications of New Works will be furnished with Dimensions of Stock Patterns, together with Approximate Weight and other data on application.

HUNT'S
EQUILIBRIUM DIRECT-MAIN GAS GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.



These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight & Coke Co. (19), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Leicester, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

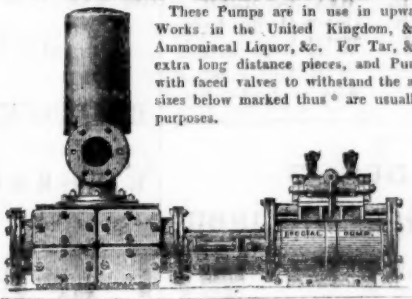
Messrs. Tangye Brothers and Holman.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,
(Signed) John Johnson.

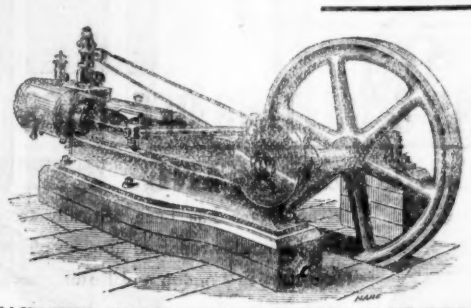
THE
"SPECIAL" DIRECT-ACTING STEAM-PUMP.

These Pumps are in use in upwards of one hundred Gas-Works in the United Kingdom, &c., pumping Water, Tar, Ammoniacal Liquor, &c. For Tar, &c., they are provided with extra long distance pieces, and Pumps are entirely of iron, with faced valves to withstand the action of the liquid. The sizes below marked thus * are usually kept in stock for these purposes.



The quantities delivered of Tar should be taken about two-thirds that of water.

Diameter of Steam Cylndr.	Diameter of Water Cylndr.	Length of Stroke.	Gals. of Water per Hour, Approx.	Prices for Water.	Prices for Tar and Ammoniacal Liqr.
*3 in.	1¼ in.	9 in.	450	£16 0 0	£17 0 0
*4 ,,	2 ,,	9 ,,	815	18 0 0	19 0 0
*5 ,,	2¾ ,,	12 ,,	1,250	21 0 0	22 10 0
*5 ,,	3 ,,	12 ,,	1,830	22 10 0	24 0 0
*6 ,,	3 ,,	12 ,,	1,830	25 0 0	26 10 0
*6 ,,	4 ,,	12 ,,	3,250	30 0 0	31 10 0
6 ,,	5 ,,	12 ,,	5,070	35 0 0	36 10 0
*7 ,,	5 ,,	12 ,,	5,070	40 0 0	41 10 0
7 ,,	6 ,,	12 ,,	7,330	45 0 0	46 10 0
*8 ,,	6 ,,	12 ,,	7,330	50 0 0	52 0 0
10 ,,	6 ,,	12 ,,	7,330	60 0 0	62 10 0
10 ,,	8 ,,	12 ,,	13,000	75 0 0	77 10 0



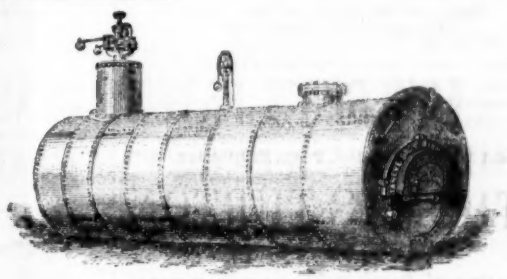
TANGYE'S HIGH-PRESSURE STEAM-ENGINE,

NEARLY 4000 IN USE.

The Design, Workmanship, and low prices of these Engines have called forth universal approval.

Nom. H.P.	2	3	4	6	8	10	12	14	20	25
	£28	£37	£44	£68	£86	£111	£122	£133	£185	£215

Including Governor and Feed Pump. Variable Expansion extra.



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This Department having been greatly extended and furnished with the most approved Boiler-making Machinery and Tools, T. B. & H. are prepared to supply all kinds of Steam-Boilers with great facility at lowest current prices.

Also Makers of IMPROVED HYDRAULIC HOISTS, TRAVELLERS, CRABS, CRANES, PULLEY BLOCKS, HYDRAULIC AND SCREW LIFTING JACKS, LATHES, PUNCHING AND SHEARING MACHINES,
And all other Descriptions of Tools, &c.

FULL PARTICULARS, ESTIMATES, CATALOGUES, &c., ON APPLICATION.

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Dublin, 1865. The SIX MEDALS AWARDED to THOMAS GLOVER for Paris 1867.

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

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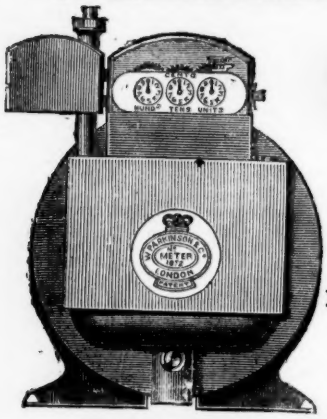
THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON AND CO.

(ESTABLISHED 1816)

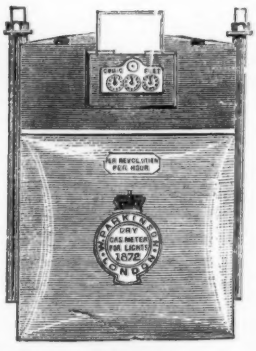


WET & DRY METERS,

STATION-METERS & GOVERNORS,

EXHAUSTER REGULATORS,

PRESSURE REGISTERS, EXPERIMENTAL APPARATUS, GAUGES, WATER-METERS, &c.



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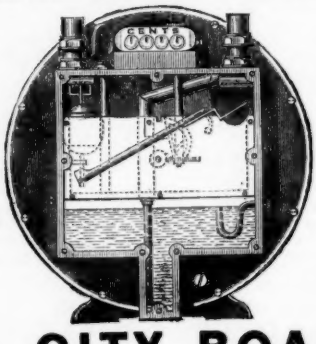
HUNT'S PATENT IMPROVED COMPENSATING METER.

In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line is much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 19, 1880.

Circular to Gas Companies.

THE almanac affords sufficient explanation, if such were needed, of the importance ascribed by *The Times* to the letter of Dr. Alfred Carpenter, on the subject of London fogs, which appeared in its columns on Wednesday last. The season is now approaching when fogs may be expected as frequent visitors to the Metropolis—if, indeed, the plural is to be accepted, and the infliction is not to be looked upon as due to one great smoke-cloud hovering over the murky "province "of houses," and appearing in one district or another as the winds compel it, but never positively leaving us altogether, even for a single day. In this particular, London has not improved of late years; it may, indeed, be said with much truth to have become very decidedly worse. Time was when the fogs, together with the odours from the river, the thunder of the countless vehicles over the paving-stones, and the blocks in the street traffic, were accepted as amongst the more striking characteristics of life in London which a casual visitor from the provinces would be most likely to retain in his memory. We have succeeded in mitigating the blocks of vehicles; wood and asphalte have replaced the granite cubes in our busiest thoroughfares, so that it is possible to hear oneself speak, even in Cheapside; the river is now comparatively pure; but the fogs are worse than ever, because more frequent. To a certain extent, according to Dr. Alfred Carpenter, the character of the modern London fog is not exactly the same as that of the old pea-soup fog of our ancestors. That was, in its essence, a true mist, resembling very fine rain, having its origin in the river or in the wet soil, and mixed with coal smoke; union in this case resulting in a strength of abomination not possessed by either ingredient separately. But on the occasion forcibly described by Dr. A. Carpenter, when he found himself enveloped in a dense fog in Hyde Park one Sunday morning lately, there was no mist at all either inside the radius affected or in the suburbs, the air being, on the contrary, beautifully clear everywhere else but at the West-end, and even in the thickest of the fog there was no moisture, the "pall" being therefore composed of smoke alone. The origin of the fog was rendered still plainer by the fact that it was distinctly flavoured with sulphurous acid, that and the unconsumed carbon itself being clearly derived from the countless household fires which were in use at the time, no factories being in action on the day in question to share the blame.

The discovery of the cause of a disease is in many cases merely a preliminary to its cure; but occasionally it serves to show the hopelessness of any quest for a speedy and radical remedy. We fear Dr. A. Carpenter's observations of the immediate cause of dry fogs belong to the latter and more unpromising class of social troubles. If this gentleman, with *The Times* at his back, had been able to announce that fogs came from the ovens where Sunday bakings were going on for all comers, or from the early Sunday excursion trains, or from the river craft, the case would have been different, and the unfortunate offenders would probably have cause to tremble before long; but the coal fire of the English householder is an institution not to be touched without great caution, and it is to be feared that, in view of the increasing and intensifying character of the nuisance, the course of procedure recommended by Dr. A. Carpenter is not very practicable in most of its leading features. His proposals would apply, of course, to every smoky town of this coal-burning land, and cannot be considered to err on the side of temporizing or half-heartedness. Briefly, he would have a Government tax, so heavy as to be prohibitive, imposed upon all grates or fireplaces which do not consume their own smoke. The result would be an increased demand for gas fires and cooking stoves, in which event gas would have to be sold at from 2s. to 2s. 3d. per thousand cubic feet. Factory chimneys would, of course, be laid under heavy restrictions as to their emission of smoke, and all Railway Companies would have their locomotives similarly regulated. When all this is done—somewhere about the time of the Greek Kalends, perhaps—London skies will be no longer obscured with black fogs, and street mists will reappear in the white fleecy forms in which they may be seen in damp corners of pasture land, or at sea.

The gas interests should be intensely grateful to Dr. A. Carpenter for his advocacy of their staple commodity, and although he contemplates the transfer of the Metropolitan Gas Companies to a Central Authority, as a necessary preliminary to compulsory use of gas for all the purposes for which coal is now in favour, we may assure him that with such an immensely increased consumption as his proposition involves, the present organization would be found competent to distribute gas at a very much lower price than that at which it is now sold. But we are not very sanguine about ever seeing the old-established London fogs abolished, at least not by the heroic measures suggested by Dr. A. Carpenter. We retain too lively memories of the result of a famous proposal to lay a small tax on matches, defensible as that project was on many grounds, to hope for an impetus to gas consumption from a Government tax on a Briton's hearth, just because it may happen to smoke. As well attempt to tax the Briton himself for the same reason. These are considerations of general policy, or social science, as it may be called, which have certainly never occurred to the enthusiastic *savant*, who would impose a task on the Executive which would appal the strongest Prime Minister, and, if attempted, shatter the largest parliamentary majority ever brought together. It is strange how well-meaning theorizers will invoke the most despotic powers when a pet theory is to be supported, though in all other things perchance the most philosophic of Radicals. It is evident that the cause of gas for cooking and heating would be in a bad way if it had to depend solely on such high-handed propagandists as Dr. Carpenter. Fortunately it is otherwise. The use of gas in this manner is increasing on its own merits, and although the day may be far distant when any substantial diminution of the smoke-pall of London may be noticeable as due to the predominance of gas where coal now reigns, it is nevertheless a source of congratulation to those who are labouring quietly to bring about this desired revolution in the domestic arrangements of our town popula-

tion, that every kitchen fire replaced by a gas-stove is a gain, if but a small one, to the purity of the atmosphere, and the consequent health and happiness of their fellow-townsmen.

Mr. Edison is in print again with a statement of what he can do with his electric lamp, and as he has thought fit to append his own signature to the communication on the subject, which is published in the last number of the *North American Review*, some notice is due to the only account we have seen of this wonderful invention which bears the name of the renowned inventor himself. At the outset, we must caution too curious readers against indulging in the hope that their desire for exact and detailed information will be satisfied on the perusal of any more complete extract from the article in question than will be found in another column. The article is, in fact, nothing more than a series of assertions that Edison's system is, and always has been a success, unsupported by any evidence that the objections already raised to the "tinder-box" arrangement are either trivial or have been surmounted; although, from internal evidence, it would appear that Mr. Edison has seen cause to reconstruct his lamp in almost every detail. The practicability of the system is "going" to be demonstrated at Menlo Park before the end of the year, according to the article.

It is now two years since the announcement of Mr. Edison's success in dividing the electric current, and in adapting its previously unmanageable power to the humblest household requirements, created the now historic "scare" among holders of gas shares. Since then the timid owners of gas property have had ample time to recover confidence, and, intermittent declarations from Mr. Edison's friends and admirers notwithstanding, gas stock now stands as firm as it has ever done. Yet again we are bidden to tremble. The scooped-out turnip is illuminated once more with the old ghostly tinder, and if another scare does not gratify the "bears" of the Stock Exchange, it will be due to the fact that the play is now too stale, the ghost has been seen by daylight, and his terrors have shrunk to nothing on close inspection. Mr. Edison has from the first allowed his fame to be traded upon and discounted by too many of his followers to receive the attention otherwise due to his present utterances. But while declining to examine his remarks in detail, because of their lack of novelty and force, we cannot omit to state, as our firm conviction on the whole matter, that if Mr. Edison's lamps, and the apparatus he has designed for use in connection with them, had been, as he contends, perfect from the first, he would never have delayed the practical demonstration of that fact, which the lighting of Menlo Park would have afforded, for a period of over two years. Yet this is precisely what he has confessed to having done; and, in fact, has not yet repaired, for that suburban neighbourhood, although lying at his own door, is not actually lighted even yet.

We do not join in the cheap ridicule of Mr. Edison, which his apparent folly in shouting before the fighting was over, or even commenced, has evoked in some quarters. We have never denied to him the possession of extraordinary talents, and still consider him one of the most versatile inventive geniuses of the age; but while we can readily admit that he may possibly succeed in making a very ingenious electric lamp, we have always denied that anything which he or any other electrician may be able to accomplish in this direction will have the destructive effect upon gas lighting anticipated by himself and his friends. And it is not very clear why Mr. Edison and others are so bent upon ruining gas proprietors. Are the people who own gas stock and earn their living by making and distributing gas such a tribe of malefactors that their extermination is a thing to be desired? If Mr. Edison would only aim at the perfection of his own work, and let gas lighting decline or flourish as fate decrees, we should have less cause for disagreeing with him. Although we recognize his genius, it is impossible to consider him consistent—a quality claimed for him by a young Transatlantic contemporary published in the interest of general science, which apparently worships at Mr. Edison's shrine, and in an early issue violently attacked the JOURNAL for daring to express disbelief in their idol's power of making good the rash predictions of his friends. There is not much consistency or even common prudence in keeping back the public proof of the utility of an invention of incalculable value, if workable, for two or three years; and when this is done we can only assume that something is wrong. In considering the failure as being due to the imperfections of the apparatus rather than to any departure from a straightforward line of action on the part of the inventor, we have, as we imagine, taken the most charitable view of the case.

The Town Council of Carlisle are in the somewhat pleasant difficulty of having a sum of money with which they do not exactly know what to do. It is scarcely necessary to explain that this disposable surplus is composed of the accumulated profits of the Corporation gas undertaking. The financial position of the undertaking is rather peculiar. Its capital value is put down at £60,476; but the amount to be set aside for the year's interest is only £704, the cost of the works having been almost extinguished. The accounts are kept in a curious form, but it appears that during the past year a profit of £5493 has been realized, and there is a balance in hand of £2212. There is an annual tribute of £2000 payable to the Corporation, but it is in respect of this appropriation that the present difficulty has arisen. It appears that when the gas undertaking first became the property of the town, grandiloquent prophecies were rife as to the public improvements which were to be made with the money of the gas consumers. But time has passed away, and although a considerable amount of cash has found its way from the gas department into the general funds of the Corporation, the absolute good which has been thereby effected is not very evident. "Lightly come, lightly gone," is about all that can be said in explanation. A market has been "tinkered," a constable's house built, and one or two other matters have been helped forward by this annual subsidy; but the great public benefits which it was to have conferred have not yet declared themselves to the expectant inhabitants of the borough. The only thing at all certain about the matter is, that although the gas consumers have been mulcted of several thousand pounds, nobody in particular has derived a corresponding advantage; and this conviction having been borne in upon the minds of the members of the Town Council, a Committee has been appointed to determine what shall be done with the money. We would suggest that the most satisfactory way of disposing of the sum which is now going begging would be to establish a reserve fund with it, whereby an element of security would be afforded to the consumers against accident to their property. For it must not be overlooked that if, as is generally granted, a thing belongs of right to him who pays for it, the Carlisle gas undertaking belongs, in a qualified sense, to the consumers. And then the next necessary step to be taken is to reduce the price of gas to the minimum required to pay expenses, and leave a slight margin to keep up the reserve to the proportions due to the extended business which would surely follow. The course of action we have indicated is the only one which can be relied upon to invariably act fairly to all parties, and prevent the possibility of dissatisfaction with the distribution of the plunder of the gas consumers. If the Corporation of Carlisle see fit to take our advice, they may expect with confidence to escape any further discussion as to their gas policy from the malcontents who are now clamouring to know how the money has gone. With respect to the remaining features of the gas accounts, the Engineer, Mr. J. Hepworth, must be congratulated on the saving he has effected in his leakage, for, with a total increased production of only about 150,000 cubic feet, he has sold 4½ million cubic feet more gas than in the previous year, the percentage unaccounted for having fallen from 7·94 to 4·59. Beyond this there is nothing of special interest in the report or accounts.

The Belfast Corporation have done exceedingly well with their gas business since they acquired the undertaking from the late Company. We shall have occasion next week to examine last year's accounts more fully, but for the present must note the salient fact, in connection with the administration of the present Gas Committee, that it is proposed to transfer £60,000 now standing at the credit of the renewal and depreciation fund, and £22,500 from the profits of the past year, making together the sum of £82,500, to the credit of capital expenditure, and so reduce the premium paid to the Shareholders of the Gas Company on the acquisition of the works. This premium amounted to £186,550, and the Gas Committee propose to continue the yearly application of a portion of the surplus profits until it is extinguished, thus leaving the original capital at the same figure—£250,000—as it stood in the Company's books. There can be no objection to this procedure, as it is only a special application of the principle of a sinking-fund, which might, in fact, be extended to the entire original capitalized cost of the undertaking. We are not altogether so sure, however, that the spasmodic diversion of large sums for a few years is quite the most convenient way in which the desired redemption can be carried out. We should have preferred to have seen a definite plan laid down for the extinction of the premium in a stated time. The proposal to hand large sums of money,

such as £82,500, from one account to another is somewhat too Napoleonic to be pleasant. Disposable amounts of this calibre are also apt to excite the cupidity of outsiders, who may be induced to believe that what can be done by a mere resolution proposed by one member of the Council, may also be done by a motion, with a different object, proposed by another ratepayers' representative. On the present occasion, a plea was raised for some £32,500 of the amount in question for building a covered market. The request was not entertained, but it may be preferred with more success at a future time. Not, perhaps, while Sir John Savage retains the reins of the department; but this veteran administrator cannot be expected to be kept at his post for ever. It is fortunate for Belfast that Sir John's intention of retiring was modified by the general desire of his colleagues into retention of office, with an efficient Deputy-Chairman for routine work. Sir John Savage is identified too closely with the borough to be allowed to retire from all control of its affairs, so long as his energies, although probably wearied, remain essentially unimpaired.

The Bedford Corporation have made up their minds to terminate their squabble with the Gas Company by purchasing the Company's undertaking, and as the Directors have no objection to part with the property if terms satisfactory to the Proprietors can be arranged, the transfer should not be attended with many incidental difficulties. It has been the custom from the earliest ages for the two parties to a bargain to differ widely as to the value of disposable property, and this principle must have been the motive actuating the Corporation in their late constant revilings of the Company. It may here be observed, however, that the price of a gas undertaking is not a thing to be substantially affected by any preliminary huckstering process, and it would have been more consonant with the dignity of the Municipal Authorities of Bedford, if they could have approached the subject in a graver and at the same time more conciliatory manner. Nothing tends so much as an inaugural quarrel to prolong and aggravate the possible disputes between vendors and purchasers in the course of protracted and sometimes difficult negotiations; and the difference in the costs of the proceedings when the parties are antagonistic, as compared with those of an amicable arrangement, should alone be sufficient, if no other reasons in favour of peace could be adduced, to cause the Corporation to drop their quarrelsome humour, now real business is in prospect, and, sinking all past differences, to meet the Company in a fair and straightforward manner, and so proceed to a settlement in the most direct and economical way possible.

Ill-advised and abortive parliamentary action by Local Boards against Gas Companies invariably leaves a most irritating effect in the inevitable bill of costs, which, moreover, comes before the public at an aggravating distance of time from the period when the fiery petitioners first commit themselves to the tender mercies of lawyers and parliamentary agents. Nothing is easier than to make (local) patriotic speeches, and to instruct the Clerk to oppose the Gas Company in Parliament; and when it is all over, nothing is more galling than to have to pay the said Clerk's "little "bill," sometimes for nothing at all, and occasionally for the acquisition of concessions, imposing enough in Committee, but of small real value to the community twelve months afterwards. The Holywell Local Board considered themselves called upon to oppose the Provisional Order applied for by the British Gaslight Company last session, and, having failed ignobly, there is now great heartburning over the settlement. They also made application to the Local Government Board for an Order to sanction the establishment of competing works, and failed by being too late. The costs are only £160, but the fact of their having been incurred uselessly rendered the consideration of the bills included in the amount peculiarly irksome to the members of the Local Board. They may console themselves with the reflection that the least said about the affair the better, and it is to be hoped that, having bought their experience, they will be in no haste to employ their Clerk on similar business in the future.

At the meeting to be held on the 2nd prox., the Directors of the Imperial Continental Gas Association will, subject to the audit of the accounts, recommend a dividend of 5 per cent. for the half year ended June 30 last, and a bonus of 1 per cent., both free of income-tax.

Sale of Shares in the Handsworth Woodhouse Gas Company.—On Wednesday last, Mr. R. Ward offered for sale by auction three £5 shares, fully paid, in the above Company, and after a spirited competition they were knocked down for £7 2s. 6d. each. Twelve others were sold at £6 per share, and another lot of 12 at £5 15s. each.

Water and Sanitary Notes.

The extraordinary magnitude of the supply furnished to London by the Water Companies is faintly appreciated by some people. The quantity last month, as shown by the official returns, was not far short of 152 million gallons per day, an increase over September, 1879, of more than 12 million gallons. In the same period of time there has been an increase of 26,694 houses—that is to say, one every twenty minutes. Facts of this description can scarcely have been present to the mind of a gentleman who writes to the Editor of the *Glasgow Herald*, making a novel suggestion for the extinction of the London Water Companies. This ingenious individual proposes that "a limited liability Company should "be formed, for the purpose of conveying water by railway "to London and other cities." The Caledonian line is specified as one which goes through a district "where choice water "can be had." This being the case, it is stated that "a train "freighted with pure water might be run daily to London, "and this first necessary of health carted through the streets "and retailed at a moderate price." Leaving out of sight the "other cities," we would call the attention of this gentleman to the number of trains that would be necessary in order to convey into London the volume of water now consumed by its inhabitants. The weight of the entire quantity last month averaged about 689,000 tons per day. If we reckon that only two-thirds of this quantity is required to be in a state of purity, the railway must bring to town some 460,000 tons per day, which, at 300 tons per train, would require a daily service of about 1500 trains. How many horses and carts would be necessary for the due distribution of the supply, we forbear to calculate, as also the "moderate "price" which the consumer would have to pay for his usual quantum, averaging, for domestic purposes alone, some 25 gallons per head per day. On the whole, we are inclined to believe that the chief water supply which the railway trains will bring to London for some time to come will be that which is contained in the milk.

The Vestry of Camberwell some short time back addressed a letter to the Metropolitan Board of Works, asking that body to make some improvement in the existing arrangements for obtaining a supply of water at fires. At the last meeting of the Board, the Fire Brigade Committee reported, in respect to one of the suggestions made by the Vestry "as "to the residences of the turncocks," that the Board had no power to make any arrangements for the purpose. Nevertheless, it is a fact that, years ago, the Water Companies expressed a desire for their turncocks to reside at the Fire Brigade stations, and offered to pay rent for the purpose. The Board declined this offer, as they have declined everything that could increase the efficiency of the present system, so far as the Water Companies are concerned. To all complaints from the public the Board have one unfailing reply—namely, that the Companies must be got rid of. That is the kind of answer now sent to the Camberwell Vestry. The Fire Brigade Committee reported to the Board, that with reference to the general subject of the supply of water at fires, it was unnecessary to remind them how frequently this had been under consideration. The Committee then went on to say that in the present state of the Metropolitan Water Question they were unable to see that the Board could take any action which would be productive of beneficial results. Proceeding on these accustomed lines, the Committee recommended that the Vestry be informed that the subject had not been lost sight of by the Board; that the Government, it was believed, proposed to submit to Parliament next Session a Bill to deal with the Water Supply of the Metropolis; and that the Board would further attend to the subject when the Bill appeared. This is the reply which is to be sent to the Vestry of Camberwell, and which fully accords with the time-honoured policy of the Board. How much property might have been saved from the ravages of fire, had the Board condescended to co-operate with the Water Companies, we will not attempt to estimate; but we may again warn the authorities at Spring Gardens that the Water Question is one on which they may meet with their own Nemesis.

The Balloon Society of Great Britain are about to undertake a variety of operations designed to promote the extinction of London fogs. We wish this great sanitary enterprise all possible success. Fogs are decidedly prejudicial to health, and in London they assume a magnitude and a density which are literally appalling. The Balloon Society propose in the first instance to find out what the actual London fog is made of, and where it comes from. Refusing to accept the dictum

of Dr. Alfred Carpenter on the subject, they are going to despatch a flying squadron of balloons in the midst of a fog, the Aëronaut in each balloon being commissioned to secure a bottle of the aërial mixture, which is forthwith to be "dropped to the earth and conveyed to a chemist for the "purpose of analysis." Dr. Frankland, it is stated, will be engaged for the purpose of analyzing the samples of fog, thus affording that gentleman an altogether new sphere for the discovery of life-destroying germs and previous animal contamination. But this is not all. The "children of the mist" are to soar above the fog, which Mr. W. H. Le Fevre states to be only 300 feet thick, and are then to explore its upper surface. More interesting still, the Aëronauts are to bombard the fog by means of dynamite or other explosive compounds, for the purpose of seeing whether it is possible to make a breach in the fog-bank, and perhaps compel the enemy to retire. At the meeting where these schemes were discussed, Captain Pim remarked that the Trinity Brethren would be greatly interested in the dynamite experiments, if only they could get the upper hand of sea fogs. Mr. Le Fevre, who was in the chair, discreetly observed that sea fogs and land fogs were very different things. "At present," said the Chairman, "the Committee "are confining themselves to the fogs of London." Captain Pim replied that he had found sea fogs ten miles from land, and he thought them quite as bad as London fogs. It having been stated that the Photographic Society were going to take part in the experiments, one gentleman—Mr. Henderson—said he "failed to see what part, so far as actual "aid was concerned, photography could play in this matter." We confess that to ourselves also this part of the subject does not appear very clear. On the whole, the meeting sustained its enthusiasm, and the proceedings terminated with a very long resolution, moved by the Chairman and unanimously adopted. The first result of this enterprise will apparently be the conversion of a London fog into a species of thunderstorm, by means of discharges of dynamite, accompanied by a meteor shower of bottles containing vapour intended for analysis. We hope there will be no accident, and that somebody will be the wiser.

Floods have been raging in town and country. A memorial to Mr. Gladstone, from the Mayor, Aldermen, and Burgesses of the borough of St. Ives, in the county of Huntingdon, calls attention to the mischief and loss thus occasioned, and raises the general question of River Conservancy. The overflowing of the Ouse affects the neighbourhood of St. Ives, and no authority exists having power to provide a remedy. It is therefore asked that the Government will introduce a measure which shall enable the owners and occupiers of land and the inhabitants of towns in the watershed of the Ouse, to abate an evil under which they suffer, in common, as they believe, with most of the river valleys of the country. It is evident that the evil is growing in magnitude, and the aggregate loss must be very severe. A system of Conservancy Boards for the whole country seems to be urgently demanded. Even the valleys of Kent and Sussex are being visited with disastrous inundations, and complaints are rife in and about London as to the frequency and severity of the floods occasioned by overflowing watercourses. Last week *The Times* spoke of Lewisham as "a submerged village" —a phrase much stronger than the fact, but nevertheless indicative of a melancholy state of things, involving loss of property as well as peril to the public health. While the drainage of land is increasing, the capacity of the rivers seems to be diminishing, owing to the presence of weeds and the silting up of the beds.

THE Directors of the San Paulo Gas Company propose paying an interim dividend at the rate of 10 per cent. for the six months ending the 30th of June last. The total receipts for the half year were £11,718 8s. 3d., the net revenue being £4395 16s. 10d. After deducting the amount of present dividend (£3941 10s.), and writing off a further 20 per cent. of the balance of Mauá and Co.'s debt (£126 9s. 8d.), they carry forward £1723 9s. 4d.

TAVISTOCK GAS COMPANY.—The annual general meeting of this Company was held on Monday, the 27th ult.—Mr. R. Dennis in the chair. The Directors reported that the gross rental for private lights for the year ending June 30, 1880, was £1689 17s. 9d., being a decrease on the amount of the former year of £154 8s. 9d.; and, after deducting the discounts allowed for prompt payment, amounting to £246 14s. 11d., the net rental would be £1443 2s. 10d. This decrease was mainly due to the reduction in the price of gas, which took place on the 1st of January, which made a difference in the gross rental of about £122. The Directors stated that, after making the usual estimates for alterations and conducting the affairs of the Company for the current year, the accounts would admit of a dividend of 12s. per share, and they therefore recommended that such dividend, amounting to £430, should be declared. The report and accounts were received and adopted. Mr. H. T. Doble and Mr. S. Nosworthy, the Directors who retired by rotation, were re-appointed. The Auditor, Manager, and Secretary were also re-elected. Mr. Greenfield proposed a vote of £10 10s. to the Directors, as an acknowledgment of their efforts on behalf of the Company. The motion was carried unanimously, and the proceedings closed.

LOCAL GOVERNMENT AND PUBLIC HEALTH.

LOCAL GOVERNMENT is not to be had without payment. Its outlay is ever increasing, and the ratepayer bears by far the greater portion of the charge. The Annual Report of the Local Government Board enlightens us on this subject, and the volume just issued tells us that during the financial year ending on March 25, 1879, the expenditure of the Urban Sanitary Authorities of England and Wales was £18,663,757, while that of the Rural Sanitary Authorities was £445,517. The receipts from current rates were respectively £7,562,684 and £200,802. The outstanding loans of the Urban Sanitary Authorities at the close of the year amounted to £56,591,080, and those of the Rural Authorities to £642,617. At the same date the aggregate value of the Urban Sanitary Districts was £49,753,326. During the last four years the annual receipts of the Urban Sanitary Authorities from current rates have increased 21·3 per cent., their annual expenses 58·7 per cent., and their outstanding loans 67·7 per cent. In the same period the rateable value of the districts governed by these Authorities increased 20·8 per cent. It is a notable fact that the outstanding loans of the Urban Authorities have increased during the year by as much as £10,407,052, or 22·5 per cent. In view of this unparalleled accession to the loan account, the ratepayer is encouraged by the consideration that, so far as the debt has been incurred in respect of "reproductive works, and especially of water and "gas undertakings," it constitutes "an apparent rather than "an actual increase in the burdens imposed on the rate-"payers;" that is to say, "assuming that the works have "been acquired or carried out at a reasonable cost, and that "due provision is made for the liquidation of the loans "within the period during which the works on which they "have been expended will be of service to the successive "generations of ratepayers, by whom they will have to be "repaid." No doubt gas and water undertakings are valuable, and the extent to which the income from these properties is made to serve as a species of supplemental rate will be a matter for consideration during those "successive "generations" to which the Local Government Board are looking forward.

Since the institution of the Board in 1871, that department has sanctioned loans to be raised by Urban and Rural Sanitary Authorities to the extent of £18,824,168. In 1872, the amount thus sanctioned during the year was £602,271, whereas in 1879 the yearly addition was £3,308,032. Since 1871, borrowing powers exercisable without the sanction of the Local Government Board have been conferred by Parliament on Sanitary Authorities to the extent of very nearly £27,000,000, exclusive of the unascertained amounts required for the purchase of twenty-four gas and water undertakings, a recreation ground, and the costs of promoting several local Acts. During the session of 1879, borrowing powers were granted by Parliament to the extent of £6,427,754, by far the greater part being required for the purposes of water supply. On this account the Corporation of Manchester alone took more than half the total. Birmingham took £489,000, Nottingham £900,000, and Cardiff £470,000, the total of the water loans being £5,284,000. The Corporations of Leicester, Nottingham, and Over Darwen obtained powers of borrowing for the generation and supply of the electric light. Similar powers, but exercisable subject to the sanction of the Local Government Board, were also obtained by the Corporation of Liverpool. The period allowed for the repayment of loans having reference to the electric light was limited in each case to ten years. In North Wales, where there has been great activity in effecting sanitary improvements, it appears that the amounts expended by the Authorities on water supply have been much less than they otherwise would have been, owing to the fact, as stated, "that "in many instances, where a water-works scheme had been "in contemplation by the Authorities, it was taken up and "carried to completion by a private Water Company." In seven years, the Sanitary Authorities of North Wales have expended £182,754 on structural works, of which £152,910 has been devoted to sewerage works, and £23,290 to water supply. More than £50,000 has been expended by the Rural Sanitary Authorities alone, of whom it is observed that they belong to a class first called into existence by the Public Health Act of 1872.

That portion of the Annual Report which is appropriated to the Metropolitan Water Supply contains nothing particularly new, unless it be a statement by Dr. Frankland that the Southwark and Lambeth Companies delivered water which approached nearer to uniform clearness than that of any of the other river Companies. Only on one occasion, in 1879, did these two Companies deliver water so bad as to be even

"slightly turbid." In this respect the Southwark and Lambeth Companies occupied a position no worse than that of the Tottenham Local Board. We also find it recorded that only on one occasion did any London Company deliver water that was "turbid," and on no occasion was the water "very "turbid." Taking the number of occasions when the water was "clear and transparent," the Southwark Company and the Lambeth have the highest figure of merit, the Chelsea and Grand Junction having the lowest. In the catalogue of "moving organisms," the Southwark and Lambeth Companies appear in conjunction with the New River as having none in their supply during the year 1879. In 1876 there were seven occasions on which the Southwark water exhibited these organisms, in 1877 the occasions were five, and in 1878 three. The change in the West Middlesex is rather remarkable. From 1869 down to 1877, both inclusive, the water supplied by this Company yielded no moving organisms, but in 1878 it did so on one occasion, and in 1879 on two occasions. In the last three years shown in the table, taking the whole of the Companies, moving organisms are reported on twenty-six occasions, whereas in the previous three years they were discovered on sixty-one occasions. The average of the whole eleven years is fourteen, and the number in the last three years was respectively eleven, eight, and seven. This would seem to indicate a progressive improvement. It is to be understood that these organisms are not found directly in the water, but in "the sediment deposited by turbid water "on standing."

Some interesting passages occur in that part of the report which describes the operation of the Sale of Food and Drugs Act of 1875. More than seventeen thousand analyses were made during the year, of which about one-third were of milk. In respect to this article, adulteration has declined, as estimated by the proportion between the samples found to be adulterated and those that were pure. But the evil is still very much too prevalent. The quantity of milk brought into London by the Railway Companies now amounts to nearly 20 million gallons annually. On the basis of a moderate estimate, it is calculated that the total annual consumption of milk in London is nearly 23 million gallons. At fivepence a quart this corresponds to an expenditure not far short of two millions sterling. According to the reports of the analysts, it would seem that nearly a quarter of this milk is adulterated with about sixteen per cent. of added water. Hence it is reckoned that the inhabitants of London "are paying between £70,000 and £80,000 "a year for water sold under the name of milk." The milk supply is therefore to some extent the water supply under another name, and commanding a rate of remuneration which Water Companies might view with envy, if only it were honest. Another evil referred to in the Report is, that persons who thus adulterate milk "are not likely to be very "particular as to the quality of the water which they use for "the purpose."

The sale of "butterine" in place of butter is apparently on the increase. This article, produced from beef fat, is also known as "bosch" and "oleomargarine." New York exports about six million pounds of this article annually, of which the greater part is shipped to Rotterdam, Hamburg, and Bremen, where it is mixed with milk and colouring agents to give it a resemblance to butter. It is then churned and converted into butterine, and re-shipped, chiefly to England. Opinions differ widely as to the quality of this article; but it is properly observed that whatever may be the merits of butterine, it ought not to be sold as butter. The percentage of adulterated samples of coffee continues high. Of course "mixtures" duly labelled are not considered adulterated, yet where the proportion is 90 per cent. chicory, and only 10 per cent. coffee, it seems a question whether this is a "mixture," properly so called. Sugar is mostly a genuine article. An adulterated sample of jam was reported to be extensively composed of seaweed. We might suggest that possibly there was a mistake in this case, the jam label being attached to a bottle of pickles. The use of poisonous colouring matter in confectionery appears now to be rare; but "cider cream," composed of strong vinegar and acetate of amyl, has been found to create "an "uncomfortable feeling" in the stomach. Sundry samples of "unfermented wine" have consisted of sugar, water, and tartaric acid, coloured and flavoured to suit the eye and the taste. The adulteration of beer appears to be steadily decreasing. Spirits suffer, like milk, from the admixture of water. Aërated waters are damaged by the presence of lead, and soda water has sometimes proved to be mere water charged with carbonic acid gas. Vinegar is frequently "infested with immense numbers of "particularly active animalcules known as vinegar eels." What effect these "eels" are likely to have on the human system is not intimated. Perhaps the most mischievous adulteration of all is that which relates to drugs, and here it would seem there is great room for improvement. Many other topics in the Report invite discussion, and perhaps we may return to it at another time.

THE GLASGOW EXHIBITION OF ARTIFICIAL LIGHTING APPARATUS.

Third Notice.

Electrical apparatus is shown by several exhibitors. At the time when our notes were taken, the electric lighting of one half of the hall, promised in the programme, was not in full operation, only one lamp, on Mackenzie's system (as manufactured by Messrs. Strode and Co., of London), being ready for use. Messrs. Strode and Co. were among the earliest adapters of gas lighting to large halls, theatres, &c., by their well-known sun ventilating burners, which are to be seen in use in large buildings all over the kingdom, and their appearance in Glasgow as makers of electric lighting apparatus is therefore the more remarkable. It must not, however, be inferred from this circumstance that the firm have any intention of abandoning the manufacture of gas-fittings, or even of sun burners, on the principle, or rather instinct, followed by rats in leaving a sinking ship. An example of Hickley's system of electric lamp construction is shown by Messrs. J. Orme and Co., of London, and the same firm show Hickley's telephones, and a set of educational electric apparatus, as patronized by the Science and Art Department, South Kensington. Messrs. D. and G. Graham, of Glasgow, have the most important stand in the hall for general electrical exhibits, chiefly consisting, however, of signals, call-bells, telegraph instruments, and batteries. They show too a perfectly successful loud-speaking telephone, samples of lightning conductors and rods, and an apparatus for lighting gas by electricity. Similar articles are also shown by Messrs. Anderson and Munro, of Glasgow. Messrs. Chance Bros. and Co., of Birmingham, show a beautifully made holophotal lens, for use in connection with the electric light, and also several dioptric ship lights of new design, to burn mineral oil. It is needless to say that the opportunity of showing the Edison light afforded by this exhibition was not seized by that enterprising inventor, and therefore visitors were denied the pleasure of seeing that masterpiece of the genius of Menlo Park.

In the department of oil lamp lighting, Messrs. Jones and Willis, of London, show a number of their "Hesperus" triplex paraffin lamps, with which they carry on war against gas at the other end of the line from that attacked by most of the present class of electric lamps. The great success of the "duplex" mineral oil lamps has apparently incited Messrs. Jones and Willis to try whether an equal meed of public favour will be accorded to a lamp with three wicks arranged in a triangle. On this principle there is, of course, no limit to the number of geometrical equal-sided figures which may be formed by the flat wicks of an oil lamp, or, for that matter, by the flat flames of gas fishtail or bat's-wing burners. But herein we may insert an apt *cui bono?* Duplex burners give a great light, but of a character particularly trying to the eyes, and with an attendant evolution of very great heat. Now, is it worth while to intensify these latter disadvantages by the addition of more wicks, even for the purpose of obtaining a still more concentrated light? We do not think this question can be answered in the affirmative. There is nothing else worth comment in the class of oil lighting appliances, and the same may be said of the specimens of mineral oil cooking stoves shown. These oil lamps and stoves are, in fact, more conspicuous by the evidence of their presence conveyed by visitors' olfactory organs than in any other way. In this respect they may be said to advertise themselves most assiduously.

We must not omit to mention the highly interesting stand of Young's Paraffin Light and Mineral Oil Company, of Glasgow, where may be seen samples of the various products obtained when bituminous shale and Boghead mineral are treated for other purposes than for their yield of illuminating gas. The importance which this peculiarly Scottish industry has attained under Dr. Young's direction is very remarkable. The latest development of petroleum, in the form of jelly, and its subsequent saponification, form the staple of the exhibits of Messrs. W. and C. Scott and Co., and Mr. W. S. Somers, of Glasgow. The successful gelatinization of petroleum was a most important triumph of chemistry, and although of recent date, the derivatives of the process are already very numerous. Vaseline, chrisma, petroline, pomeline, and many more names, have been given to the ointments made from partially solidified petroleum, and the soap made from the same base is equally deserving of the favourable reception which has been already accorded by the members of the medical profession as well as by the general public to these elegant preparations.

Water-works apparatus and fittings also find a place in the hall, and although not shown in great numbers, deserve attention.

Messrs. J. Tylor and Sons, of London, show some water-meters and a few specimens of their waste-preventing appliances. The Glenfield Iron Company, Limited, of Kilmarnock, have a stand of water-works fittings, comprising valves, hydrants, cocks, and their accompanying road fittings; all strongly made and useful articles, not got up for show, but for heavy wear. The same manufacturers also show some flushing-valves, man-hole covers, sewer ventilating grates, and other sewerage fittings of similar character. Kennedy's Patent Water-Meter Company, of Kilmarnock, exhibit one of their specialties, with a glass cylinder, showing the action of the meter, which is extensively used throughout the kingdom. The Manchester

Water-Meter Company, Limited, show several of their meters, part in action; and Mr. David Johnston, of Glasgow, shows his positive water-meter, constructed in the form of parallel cylinders, the same principle being applied by him in the water-engine shown, by which organ bellows may be blown without the use of intervening gearing. Water-power engines are also shown by the Tuerk Patent Hydraulic Motor Company, of Glasgow; these engines are remarkably neat, of small compass, and have a direct rotary motion. Messrs. A. Barr and Co., of Glasgow, show three of their double cylinder water-engines, which are about as simple appliances for developing power from water pressure as could be devised. The Waste-Water Meter Company, Limited, of Liverpool, show one of Deacon's waste-water meters in action, the water supply to the exhibition hall being passed through it. These admirable appliances for detecting waste are of such proved utility that recommendation of them in these columns would be needless. The power of determining the total volume of water supplied, used, and wasted, in districts provided with these meters, is naturally of the highest importance to those responsible for the control of the water supply of towns, and it is therefore easily to be understood that Mr. Deacon's invention is highly prized wherever its merits are known. One of Mr. Deacon's water-pressure reducing valves is also shown by Messrs. Gilbert Bogle and Co., of Glasgow. Another example of the reducing valve, the object of which is to check the pressure of water in the main to that required for ordinary consumption, is the invention of Mr. Foulis, of the Glasgow Corporation Gas-Works, exhibited by Messrs. Alley and Maclellan, of Glasgow. The principle of the valve is substantially the same as that of a bye-pass gas-governor, modified to meet the requirements of the purpose for which it is intended, and it is susceptible of various special arrangements. It is of simple construction, and occupies very little space. The same firm also show some serviceable gas and water valves.

There are several stands of internal house-fittings, having reference to water supply and sewerage. Mr. W. Ross, of Glasgow, has on view a Bramah water-closet and cistern, fitted with water-waste preventer and after-flush arrangement. Mr. R. Meldrum, of Edinburgh, shows various designs of traps, sinks, wash-basins, &c.; as do Messrs. J. and M. Craig, of Glasgow, who are makers of a peculiar kind of stone-ware for baths, troughs, and pipes. Messrs. Robert Boyle and Son, of Glasgow and London, show in the annexe a number of their revolving ventilating cowls, for rooms and soil-pipes, the contemplation of which is strongly provocative of vertigo. The British Sanitary Company, of Glasgow, have a stand whereon is displayed the so-called "Perfect Purifier" of Mr. Joyes, now so freely advertised. This material is a product of coal tar. More ventilators for drains and dwelling-houses are shown by Mr. W. P. Buchan, of Glasgow, together with yet another pattern for a water-closet.

Next to the provision of efficient means for the production of fire and light, is the necessity for effectual power of controlling and extinguishing conflagrations, which are the results of a useful slave becoming a particularly bad master. Consequently, in addition to the ample supply of water at hand in case of such an untoward catastrophe, there are several kinds of portable chemical extincteurs shown in the hall, serving at once as exhibits and useful aids in a possible emergency.

There are several stands of exhibits besides those named, such as are invariably to be seen at exhibitions of all kinds wherever held, without any particular reference to the special objects contemplated in the arrangements. These we are not at all concerned with, our purpose in these cursory notes being to give those of our readers who may be unable to visit Glasgow, an idea of the extent and character of the very admirable exhibition which the Executive Committee and their indefatigable Secretary (Mr. Mann) have succeeded in organizing. Enough has now been said, as we would hope, to show that, spite of certain gaps and interruptions in the order of subjects for illustration as originally projected, the articles shown, besides being generally of a high class and worthy of careful inspection on their own account, form a fair epitome of the materials and appliances in use at the present day—chiefly, indeed, for the purposes of giving artificial illumination, for warming, and for the general service of the kitchen and household, but also to some extent for other very varied necessities of an urban population.

East London Water-Works Company.—The ordinary half-yearly assembly of the Proprietors of this Company was held at the Offices, 16, St. Helen's Place, E.C., on Thursday, the 7th inst.—Mr. J. Coope Davis in the chair. The report of the Directors, which was adopted, stated that the revenue from water-rates during the half year ending June, amounted to £106,112 5s. 1d., or an increase of £3803 11s. 2d. over the corresponding period of 1879. The ordinary expenditure had been £42,913 16s. 9d., showing a decrease of £1312 15s. 5d. The revenue account had been temporarily affected by exceptional charges—viz., the balance of the cost of re-constructing certain filter-beds, £2952 11s. 3d.; and the transfer to this account from capital of a large portion of the amount paid to the New River Company for re-adjustment of the boundary line between the two Companies, amounting to £1556. The expenditure on capital account amounted to £26,405 0s. 7d. The excess beyond the amount of capital authorized was £20,227 4s. 6d. The water pumped during the half year was 5,907,628,876 gallons, being an increase of 373 millions of gallons; while 2744 additional supplies had been laid on, and applications continued to be very numerous. The new Albert Docks and district of Silvertown were, the Directors said, making great demands upon the Company, to meet which a new main, crossing the Barking Road Bridge—for which purpose special provision would be required—had been laid, the estimated cost being £12,000. The Essex district was also rapidly increasing, large estates being laid out there. As the expenditure for capital purposes had exceeded the amount authorized by Parliament, and the large demands for additional supplies required to be met by new mains, applications must, it was announced, be made to Parliament in the ensuing session for power to raise additional capital. A dividend at the rate of 6½ per cent. was declared.

Notes.

[*This column is intended to contain miscellaneous memoranda on topics of general professional interest to our readers. We shall be glad to receive for insertion in it any scraps of information, observations of facts, or descriptions of apparatus, &c., which may be worth publication, and yet may not be considered suitable for our "Correspondence" column.*]

The Livesey-Somerville Generator Furnace.

Generator furnaces of an improved and thoroughly satisfactory type are now in use at the Old Kent Road station of the South Metropolitan Gas Company, where several through settings, having been refitted for generator firing, have been recently lit up for the winter. As we intend shortly to give a detailed description, with drawings, of the Livesey-Somerville generator furnace in its latest perfected form, it will suffice for the present to describe it briefly and generally. As constructed in a stage retort-house, not designed with special reference to generator firing, the settings of sevens previously used are retained, and nothing in the appearance of the retort-beds, as seen from the charging-floor, would indicate that they are heated in any unusual manner. The generator is in the place of the old furnace, self-contained in the setting, instead of being built apart, as is the general practice of the German engineers. The extra depth needed to make an ordinary open furnace into a carbonic oxide generator is, in the present case, easily obtained. The air necessary for the first act of combustion is admitted by a single slit in the bottom of the generator, through the crown of the arch which supports the bench; access to the slits from below being thus particularly easy. The slit is formed in the arch by a cast-iron curb. Steam is admitted with the air, by the slit, from a perforated pipe just beneath the cast-iron curb, ranged sufficiently on one side to be out of the way of the falling ashes. The air for the second, or final combustion of the carbonic oxide and hydrogen formed by the action of the first supply of air and steam to the deep layer of coke in the generator, enters by two openings in the crown of the lower arch, one on each side of the slit. These holes communicate with cast-iron pipes of rectangular section, built into the brickwork of the setting, and terminating in openings in the brickwork of the generator just above the maximum height of the fuel. The secondary supply of air is consequently heated, before it enters the generator and meets the carbonic oxide, by heat conducted by the walls of the generator, and from the lowest flues of the setting. The double combustion goes on with perfect order from the first regulation of the air and steam inlets. No clinker is formed, only ashes and loose friable rubbish being dropped from the slit, which seldom needs attention. The steam required is provided by boilers heated by the waste heat from the main flue of the retort-stack, and therefore does not cost anything for fuel or stoking. The appearance of the generator inside, when the firing-door is open, is that of a rather dull-burning furnace, filled, above the fuel, with pale yellow flame. The retorts can practically be maintained at any required heat, the power of the generator being capable of regulation to the greatest nicety; but sensational heats and heavy charges worked off in quick time are not in favour at the Old Kent Road. There is, however, no difficulty experienced in obtaining, in an ordinary way, a production of over 9000 cubic feet of gas per mouthpiece in 24 hours, with an expenditure of fuel equal to about 16 per cent., by weight, of the coal carbonized. By the peculiar situation and construction of these generators, they can be built at a very trifling excess of cost, per retort, over settings fired in the usual way.

Dieterich's Regenerative Furnaces.

Our American correspondent, writing under date of the 30th ult., says: "When they have had an opportunity at Baltimore to test their new Dieterich's furnaces, I hope to give you the results thereof. The furnace put in at a small works in Connecticut, to which I referred in one of my published letters (see *ante*, p. 346), is doing well, giving 8400 cubic feet of gas per mouthpiece, and the bench, which is one of 5 retorts, is not worked to its full capacity. The furnaces are being introduced in several other Eastern cities, but are not yet under fire."

A Gasholder without Trussing or Scaffolding.

The superfluous character of any form of trussing for the crowns of gasholders is made plain in a very striking manner by a spectacle at present visible at the Greenwich station of the South Metropolitan Gas Company. A holder, 140 feet in diameter, in course of repair, had to be hoisted up out of the tank. The holder being untrussed—a wooden scaffolding fixed in the tank serving to support the dome sheeting when all the gas is out of it—the usual course would have been to have cut the crown out, and, leaving it on its supports, to have subsequently pulled up the sides with screws. Instead of this laborious operation, it was decided to blow the holder up in the usual way to the required height, seize the bottom curb with suitable tackle, and then open the blow-off cock in the summit of the crown, and let the sheeting hang loose. The result answered every expectation. The dome began to sink from the centre as the gas escaped, and finally, without shaking or buckling more than when settling on its proper supports, it assumed a wavy shape, the centre being depressed somewhat below the line of the top curb, but the outer sheets retaining their rise. In this state it now remains, the crown is not in the least damaged, and there is no reason to suppose that any difficulty will be experienced in restoring the dome to its pristine shape when the internal pressure of gas is again applied. From this example, on by no means a small scale, it would appear that, except for the convenience of construction in the first place, even a fixed staging in the tank is not really essential

for the safety of the crown of a gasholder. The matter would be slightly complicated by the presence of the water surface at a higher level than the point at which the centre of the dome would hang at rest, if the crown were emptied while the holder remained in its place in the tank; but if there were a liability to buckles from this cause, as is very probable, it might be prevented by letting the water rise up and cover the crown. It is needless to point out that a large dome would be less liable than a small one to damage from any such process of inversion as that above described, as, in consequence of the length of the arc of its section, the angles of the wavy ridges mentioned would be less severe.

The Use of Gas for Lighthouses.

Recently issued parliamentary papers on the subject of the Copeland Island light, situated at an important turning-point of Belfast Lough, give a graphic account of the endeavours made by the Commissioners of Irish Lights, in the face of the opposition of the Board of Trade, to procure the Board's sanction for their proposal to adopt gas instead of oil as a means of illuminating that station. The case for gas was further prejudiced by the adverse opinions held by Mr. Douglass and Captain Cole, the professional advisers of the Commissioners, whose official comparative estimate of cost for establishing and working gas and oil lamps at the station in question was made to show strongly in favour of the latter. This was, however, leaving out of sight the great difference in power of the two lights, for whereas no oil lighthouse lamp that has ever been constructed gives a light of more than 722 candles, the Wigham triform gas-burners, with 108 jets, possess a possible illuminating power equal to nearly 12,000 candles, at a cost of 1s. per candle per annum on the usual computation of the hours of lighthouse illumination, as compared with 4s. 8d., the ascertained cost of one candle power derived from paraffin. This method of computation apparently opened the eyes of the Central Authorities, and after much red tape had been wasted on both sides, the Irish Commissioners carried their point, and the lighthouse is to be fitted up with one of the most powerful burners Mr. Wigham can devise, adjustable to various fog powers, with a fog "siren" accompaniment. The testimony to the value of gas as a fog-penetrating agent, offered by many masters of the Channel mail-boats, and other experienced seamen, is most convincing. According to these practised observers, when a fog is so thick that no oil lamp can be seen, and a gaslight itself is invisible, the glow with which it pervades the fog is so unmistakeable that there is never any difficulty in ascertaining the bearings of a lighthouse so illuminated. This statement is supported by Professor Tyndall, the scientific adviser to the Board of Trade, who strenuously supported the recommendation of the Commissioners. It is instructive to note that the Board of Trade, in the course of their correspondence with the Irish Commissioners, practically placed the electric light out of the question, on the ground that the attendant expense was so heavy as to exclude its application beyond the three stations at which it is at present in operation.

Advertising by Illuminations.

At the establishment of a well-known firm of merchant tailors, &c., at the corner of the Minories, a brilliant and successful example of this method of advertising may be witnessed any night between the hours of six and eight o'clock, and on Saturdays until ten. Messrs. J. Defries and Sons, of Houndsditch, were commissioned to illumine the exterior of a large and handsome block of buildings in Aldgate and Minories, and the result of their labours has been eminently successful. An outside service of gas, laid on from the main, surrounds the whole of the windows, and extends along the length of both frieze and parapet. Ten thousand gas-jets, in various coloured globes, outline the building; and in the centre, immediately in front of the large window, is an amber star of great size depending from a graceful scroll of variegated colour. By an ingenious arrangement the whole of the jets are lighted up at once, and the effect produced by the sudden starting of the vast building from darkness into brilliant outline is novel and striking, and adds another to the many successes already scored by the above-named firm in the way of artistic illumination. It is well worth while to see the display, either as an excellent specimen of the illuminator's art, or as an illustration of what can be done by an enterprising firm now-a-days in the way of advertising.

The Water Supply of Hayward's Heath.—It may be remembered that on the 21st ult. a special meeting of the Hayward's Heath Local Board was held for the purpose of taking into consideration the question of joining with Cuckfield and neighbouring places in providing a better water supply for the district. Two of the places suggested having refused to take any steps in the matter, a public meeting was held on Monday last week, at the Corn Exchange, Hayward's Heath, to consider the advisability of establishing water-works for this district alone; but after some conversation the proposition was rejected by a large majority.

The Public Lighting of Waltham Abbey.—A public meeting was recently held at Waltham Abbey "to discuss the advisability both of lighting the town with oil as a substitute for gas, and also to request the Local Board to take into consideration at their next meeting the necessity of constructing gas-works for the district;" the Board, at their last meeting, having by a majority of one refused to accept the tender of the Gas Company for lighting the public lamps during the whole of the night, for eight months, at £3 13s. 6d. per lamp, in consequence of which the town had remained in darkness. Mr. Speller, who occupied the chair, compared the price proposed to be charged by the Company with those paid at Walthamstow, Romford, and other places in the locality, and urged the meeting to send a memorial to the Board, asking them to take steps to alter the existing condition of affairs. He had no hesitation in saying that they would save something like £40 in the first year, and have more lights, if they adopted oil. Mr. Tait moved—"That the town from this time be lighted with paraffin." Mr. Williams seconded the motion, and it was put and carried.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

MR. G. LIVESEY ON THE ECONOMY OF CARBONIZATION.

Sir,—The article communicated by Mr. George Livesey, in your issue of this week, on high yields of gas per ton of coal carbonized, opens up a question which has repeatedly been raised, and as often shelved without any definite result being arrived at, which should determine once for all within what limits high heats in the retorts, and consequent large production of gas per ton, may, with economy, be adopted.

Perhaps a large quantity of gas per ton has, in some cases, been produced simply for the purpose of gaining credit on that ground alone, and "vaunted" without consideration of ulterior effects. In other cases where comparisons have been made, the fact of increased production has been stated without the reason being given why this principle has been followed. I must confess, for my part, that I have not been altogether free from blame in this latter respect. There should be a reason for everything, and the engineer who goes in for a high yield of gas should do so only from a line of reasoning which convinces him that high heats will ultimately increase the revenue and promote the welfare of the undertaking he manages.

The question of high heats is, however, not one of increased production alone. It is far more one of *quick* production. The principle I have always relied upon is that rapid carbonization evolves more light-giving constituents from the coal than slow distillation. Rapid carbonization is to be obtained by high heats and light charges of short duration.

Mr. Livesey thinks, from the investigations of Mr. Leicester Greville, that high heats have but little effect in transferring the light naphthas from the tar to the gas. It appears to me that this is an incorrect way of stating the process. The heat applied in the carbonization of the coal can hardly be said to *transfer* light-giving constituents from the tar to the gas, inasmuch as the tar is not formed until the gas has left the retort. If, however, as I believe, a high heat converts more hydrocarbon into gas, and less into that thick vapour which is rapidly deposited as tar, may it not be often the case that, where high heats are in use, the condensing arrangements are such as to effect an absorption of the light naphthas, or other hydrocarbon vapours, from the gas into the tar at a later stage in the process of manufacture? It is readily conceivable that the form and extent of the condensing apparatus determines the quantity of hydrocarbon vapours which can be retained in the gas. The proportion would be subject to slight variations from the difference of atmospheric temperature and the quantity of gas being manufactured at any given period, but the condensing apparatus will place a limit to the proportion of light naphthas retainable in the gas, generally below the absolute and possible limit attainable with an absolutely perfect condenser. Besides, it is not only a question of retaining the more volatile hydrocarbon vapours. At a meeting of the Southern District Association of Gas Engineers and Managers, I suggested that the lighter hydrocarbons had the property of retaining by affinity the heavier ones, such as naphthaline. Mr. Greville has also propounded the same theory, in support of which he refers to the great increase in the illuminating power produced by using Aitken and Young's analyzer—an increase which cannot be due alone to the retention of the light naphthas.

There is, to my mind, no question that the total light-giving value of the gas produced from a ton of coal at a high heat is greater than when the coal is distilled at a lower temperature. I have repeatedly and continually proved this in regular working. When I took the management of these works, the make of gas averaged 10,000 to 10,200 feet per ton. It had been previously much less than this, but neither then nor later did the illuminating power average more than about 15 candles, according to the records kept. During the last four years the average make per ton has been quite 500 feet more, but the illuminating power has *not* been lower. To-day the make is 10,588 cubic feet per ton, and the illuminating power 15·96 candles, while the usual average is 15 to 15·5 candles. The coal is from the same pit as that which has been carbonized here, with little exception, since the commencement of the Company's operations, and no cannel has ever been used. It is true that the fuel account has been somewhat in excess of the quantity formerly used, but 10 per cent. is a very excessive amount with which to debit the production of 500 feet more gas. Three per cent. has sufficed to make the difference in my case, though something must be allowed for improved retort-settings.

Then, again, Mr. Livesey reckons 1 gallon of tar less for the extra 500 feet of gas. Has he really found by practical experiment that 500 feet more gas means 1 gallon of tar less? The Commercial Gas Company's accounts, published in last week's Journal, show 10·9 gallons of tar produced per ton of coal, and my own accounts to the 30th of June show 11·4 gallons. In the former case the make of gas averaged 10,400 feet, and in the latter case 10,680 feet; so I do not think there is much lost by a diminution in the production of tar.

Wherever the maintenance of high heats in the retorts is desired, it should be sought to be obtained by improvement in the method of heating and the construction of the retort-settings, and not by "hard firing." In this direction Mr. Livesey is himself working, and though not aiming at the attainment of high heats, he will find eventually that his efforts in this direction will have the effect of promoting the adoption of increased temperature in the retorts. So long as high heats can only be obtained by employing a tearing draught in the furnace and a greatly increased expenditure of fuel, there will remain much reason in the arguments of those opposed to the use of high heats; but with the introduction of the regenerative system of heating, these objections will cease to have force. Already, with the improved furnaces at work in this country, although the regeneration is by no means so perfectly carried out as it might be, retorts are made to produce 20 per cent. more gas in the 24 hours without any increased expenditure in fuel, and at one works the Manager has been able to report to his Directors that 700 chaldrons more coke were available for sale last quarter than in the corresponding period of the previous year, although 120 tons *less* coal had been carbonized.

Mr. Livesey will be doing good service by carrying out the experiments he proposes. At present he appears to have somewhat prejudged the question. Not desiring, for the sake of economy, to use cannel, he is obliged to reduce his make to keep up the illuminating power. If Mr. Livesey would try raising the heats and *shortening* his charges, I think he would find he could produce 16-candle gas with the use of fewer retorts, and with a somewhat increased production of gas per ton of coal carbonized.

Gas-Works, Peterborough, Oct. 13, 1880. G. ERNEST STEVENSON.

SIR,—Mr. Livesey has brought into prominence a subject that is most deserving of discussion, and his letter affords another illustration of the uncertain character of the traditions which not unfrequently govern gas management.

That "dividends are made in the retort-house" is probably the most fixed and cherished belief of the manager. Perhaps that was why I fell out with it years ago, for one by one I had found these traditions false, and at length regarded them all much as Sir Peter Teazle, after matured experience, did "fine sentiments."

Agreeing, as I do, with the case against a high yield of gas per ton, as put forward by Mr. Livesey, I think there are some most important points not touched upon by him, and I shall be glad if you will afford me space briefly to lay them before your readers.

In the first place I would remark that, beguiled with the "honest trifle" of excelling in the retort-house, the manager becomes very liable, in order to maintain a supremacy upon which he may pride himself, to ignore more or less the true market value of coals, and to choose only such material as will assist in keeping up his reputation as a gas-maker. Thus he may limit his selection to screened qualities, to the exclusion of the unscreened, nuts, or slack; or he may go farther still, and confine his business to a particular locality or colliery.

The evil consequence of such procedure is immense. Competition is minimized, and all the advantages that accrue therefrom are lost to the Company. Any one who has opened wide the door to all competitors will agree with me that the difference between the two systems of purchasing cannot be less than the value of from 1000 to 3000 feet of gas per ton. Of course, the previous high yield will not be realized, but the lower cost of coal will more than compensate for the deficiency.

But, after all, the loss may be more imaginary than real. If a coal gives much coke, I should say there is presumptive evidence of inferiority for gas-making; for, that residual apart, it matters little, at present prices, whether the products are sold as gas, or tar, or ammonia. Weight for weight, tar is more valuable than gas, and ammonia should produce, in many localities, as large a return as tar.

These considerations, as Mr. Livesey has pointed out, should detract much from the value of statistical information, which, generally accepted as proving much, is worth in most instances extremely little. I can quite conceive, however, that stupid people who see no farther than their noses, may say, on taking up this aspect of the case, that so long as coal is thrown into a retort there is no use for the manager. The fact is far otherwise. Markets are always varying, and a policy that is good to-day may be bad a year hence. The management should, therefore, be intelligent to perceive, and sufficiently untrammelled and facile to vary with a dozen eventualities. Such analytical and commercial exercise, I venture to say, will prove more profitable to all concerned than that of everlastingly singeing one's pate over the furnaces; and overweening faith in the retort-house once broken in upon, it will soon become apparent how comparatively little high heats have to do with dividends.

Leeds, Oct. 16, 1880. HENRY WOODALL.

SIR,—The question put by Mr. Livesey, in your issue of the 12th inst., as to the high yield of gas, per ton of coal, being an infallible test of good management can but receive one answer in the form which it takes.

A high yield of gas may be, and, in my view, is a fair rough-and-ready test of good management; but certainly is not an infallible one, nor any criterion whatever where, as in London, we have to pay such extravagant prices for cannel to make up the illuminating power, which the dilution of the extra quantity of gas made brings considerably below the standard to which we have to work on a system of daily and rigid testing by public authorities. The effect of this cost is shown in my own experience, where the use of 6½ per cent. of cannel raises the price per ton of coal 1s. 7d. all round. Mr. Field's "Analysis of the Metropolitan Gas Companies Accounts" supplies the answer in this case in the shape of Mr. Livesey's own unrivalled economy of production. It may become a question of "buying gold too dear."

Nevertheless, in cases where the illuminating power required is within the product of black coal worked alone, there are very many points to be urged in favour of using this criterion as a rough test of general good working. It speaks for the condition of the carbonizing plant, for its efficiency, and for its careful management.

I have been pleased to notice from various parts of the country very largely increased returns per ton of coal (nearly 11,000 cubic feet) in cases where the illuminating power is not impeached; and while I think we are, many of us, too much the slaves of fixed ideas on these matters, and that extra production must be dismissed as an *infallible* rule of guidance, these results are nevertheless very valuable and instructive. Did leisure permit, I think I could show a good many excellent grounds for not altogether slighting this standard of estimation.

How prone one is to attach religiously to a fixed idea, without sufficiently investigating it, is, to my mind, illustrated at the present time by the general confusion prevailing, whereby the results of good retort plant, well devised and manipulated, are being attributed to the mechanical appliances by which the coal is merely fed into the retorts.

London, E., Oct. 18, 1880. H. E. JONES.

THE DISTILLATION OF COAL TAR.

SIR,—As my introduction of Messrs. Trewby and Fenner's patent to your readers, in the JOURNAL for the 5th inst., was anonymous, I shall feel much obliged if you will publish this letter from me—to save the patentees from being suspected of puffing their own invention, and to explain to Mr. Ford that at the end of the specification (which was cut down to save space) the patentees acknowledge that something of the sort had before been tried. Of the results we know nothing; but one thing is certain: The advantages must have been small compared with those known to accrue from the use of the process now under consideration, or Mr. Ford would not have wondered why any one in these days should be "at the trouble and expense of patenting a process" proved to be good and practicable "upwards of 30 years ago." Would it not be with us still?

Oct. 13, 1880. W. MANN.

MESSRS. H. and C. DAVIS and Co., of Camberwell, write to say they are not the firm referred to in the letter from Messrs. Stark and Co., published in the JOURNAL of the 5th inst.

MR. J. O. N. RUTTER, of Brighton, has written to call our attention to the prevalence of defects in vision, arising from disease of the optic nerve, which are beyond the power of spectacles to cure, and when present in a mitigated form may account for some of the continual complaints of the low illuminating power of gas indulged in so freely by many people. Arguing from the recently-revealed frequency of colour-blindness, at one time regarded as a rare visual affection, Mr. Rutter is of opinion that insensitiveness to light may be more common than is generally suspected. This may be so, but however consoling it might be to a gas producer to believe that the optic nerves of a discontented consumer were deranged, the discontent will remain a fact, whatever its cause, and the malcontent would probably resent any imputation on his own powers of vision as a personal insult. So that unless a gas consumer is commonly known to be partially blind, his word, in the shape of indignant letters to the local newspapers, will generally be found to carry weight when the quality of gas is in question; whereas, according to Mr. Rutter's theory, he may in reality be fitter for the interior of an ophthalmic hospital than as an authority on visual photometry.—ED. J. G. L.

Legal Intelligence.

PONTYPOOL POLICE COURT.—SATURDAY, OCT. 9.
(*Before Mr.* E. J. PHILLIPS *and Col.* BYRDE.)

ALLOWING WASTE OF WATER THROUGH A CLOSET.

Mr. *Henry Witchell*, of Broad Street, Blaenavon, was summoned, at the instance of the Blaenavon Gas and Water Company, under the 17th section of the Water-Works Clauses Act, 1863, for having caused a wilful waste of water belonging to the Company.

It appeared from the statement of Counsel, borne out by the subsequent evidence adduced, that on the 29th of last month, the Manager of the Company (Mr. C. White) went about midday to defendant's shop, for the purpose of inspecting the gas-meter. Just before leaving, he heard the sound of water rushing through the service-pipe leading to the water-closet. He asked to see Mr. or Mrs. Witchell, but neither of them was in, and, telling the servant what he was about to do, he went upstairs to the closet, and there found that the handle was propped up with a brass stair-rod, and that the water was running to waste to the extent, as he subsequently ascertained, of 200 gallons an hour.

Defendant did not deny wasting the water, but said that he let it run through the closet by order of his medical attendant; and if he had not carried out his instructions he would probably have been liable for breach of the sanitary regulations. He was in a very awkward position between the requirements of his medical man and the regulations of the Company.

Mr. PHILLIPS said defendant's medical man ought to have known better than to have told him to do a thing which was illegal, and fined him 10s., including costs.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

The Registrar-General publishes the following table in reference to the water supply of London during September. According to returns furnished to him by the Metropolitan Water Companies, 151,744,660 gallons, or 689,445 cubic mètres of water (equal to about as many *tuns* by measure, *tons* by weight), were supplied daily, or 255 gallons (115·9 decalitres), rather more than a *ton* by weight, to each house, and 35·9 gallons (16·3 decalitres) to each person, against 34·5 gallons during September, 1879.

COMPANIES.	Number of Houses, &c., supplied in Sept., 1879.	Number of Houses, &c., supplied in Sept., 1880.	Aver. Daily Supply of Water in Gallons* during Sept., 1879.	Aver. Daily Supply of Water in Gallons* during Sept., 1880.
Total supply	568,857	595,552	139,492,637	151,744,660
From Thames	272,442	285,179	70,636,744	75,890,934
„ Lea and other Sources	296,415	310,373	68,855,893	75,853,726
THAMES.				
Chelsea	29,700	30,071	8,733,100	9,060,560
West Middlesex	53,062	55,449	10,621,635	11,583,470
Southwark and Vauxhall	87,821	91,699	21,947,304	24,847,364
Grand Junction	39,648	42,671	12,120,355	13,109,760
Lambeth	62,211	65,289	14,211,300	17,289,900
LEA AND OTHER SOURCES.				
New River	128,837	131,693	28,912,000	30,765,060
East London	120,459	128,050	31,566,500	35,855,600
Kent	47,119	50,630	8,377,393	9,233,726

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for September, 1880, as compared with that for the corresponding month of 1879, shows an increase of 26,694 houses, and of 12,252,023 gallons of water supplied daily.

The following is Dr. Frankland's report of his analyses of the water supplied to London during September:—"Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies, and by the Tottenham Local Board of Health, was—Colne Valley, 1·1; Kent, 1·6; Tottenham, 2·6; New River, 3·8; Chelsea, 4·1; East London, 5·9; Southwark, 6·8; Lambeth, 6·9; West Middlesex, 7·4; Grand Junction, 7·4. Except the supply sent out by the

Chelsea Company, all the water drawn from the Thames, although in every case efficiently filtered, was again unfit for dietetic purposes, owing to the large quantity of organic matter which it contained. Of the water drawn from the Lea, that distributed by the New River Company was of much better quality, but that sent out by the East London Company was little better than Thames water. Both waters were efficiently filtered. The high temperature of the river waters rendered them vapid and unpalatable. The deep-well water supplied by the Kent and Colne Valley Companies was of its usual excellent quality for dietetic purposes, but that delivered by the Tottenham Local Board of Health was, though much better than any of the river waters, less good than usual. Seen through a stratum two feet deep, the waters presented the following appearances:—Kent and Colne Valley, clear and colourless; Tottenham, clear and nearly colourless; New River, clear and very pale yellow; Chelsea, clear and pale yellow; West Middlesex, Southwark, Grand Junction, Lambeth, and East London, clear and yellow."

Results of Analyses expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solid Matter.	Organic Carbon.	Organic Nitrogen.	Ammonia.	Nitrogen, as Nitrates and Nitrites.	Total combined Nitrogen.	Chlorine.	Total Hardness.
Inner Circle.								
Thames—								
Chelsea	25·84	·207	·036	0	·114	·150	1·6	22·4
West Middlesex	27·18	·389	·049	0	·176	·224	1·6	20·8
Southwark	30·36	·354	·055	·002	·177	·233	1·5	22·4
Grand Junction	27·88	·390	·045	0	·144	·189	1·5	21·5
Lambeth	29·42	·363	·049	0	·167	·216	1·6	20·9
Lea—								
New River	29·22	·165	·059	0	·208	·267	1·7	21·8
East London	31·90	·306	·045	0	·237	·282	1·9	21·8
Deep wells—Kent	41·74	·085	·010	0	·455	·465	2·5	26·9
Outer Circle.								
Colne Valley	10·80	·069	·018	0	·341	·362	1·5	6·7
Tottenham Local Board	40·88	·136	·019	0	·022	·041	2·8	23·6
Corporation of Birmingham*	25·04	·182	·031	·002	·264	·296	1·9	13·2
Corporation of Glasgow†	2·90	·174	·014	0	·007	·021	·65	1·05

* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.
† Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

CARLISLE CORPORATION GAS AND WATER SUPPLY.

At the Meeting of the Carlisle Town Council last Tuesday—the Mayor (Mr. W. I. R. Crowder) in the chair—the Manager of the Gas and Water Works (Mr. J. Hepworth) submitted the annual abstracts of the accounts of the departments for the year ending June 30, and the minutes of the Gas and Water Committee which contained the following report:—

Your Committee have the agreeable duty of again reporting upon a year of continued prosperity in the gas and water departments.

In the statement of accounts herewith submitted it will be seen that the profits realized are as follows:—

Gas department	£5492 18 10
Water department	3172 11 9
Total	£8665 10 7

Gas-Works.

The various and extensive alterations and additions to the Mill Street Gas-Works, and the Boustead's Grassing works, including the new gasholder and the sulphate of ammonia plant, have been completed and brought into successful operation during the past year. Such improvements have also recently been introduced in the gas-making department as will considerably lessen the cost of production; and the loss of gas by leakage has been materially reduced during the past year.

Your Committee regret that the proposed siding to the Mill Street works has not yet been made.

The consumption of gas continues to increase, although the increase is less than in recent years; but your Committee consider that the use of gas might be extensively increased if the advantages of gas for cooking and heating, and also as a motive power, were as well known in this city as in many other places where gas is sold at a much higher price.

An application for a supply of gas to Botcherby has been received during the past year. Your Committee have named the terms and conditions on which they could comply with the application; but no further steps have as yet been taken by the inhabitants.

The following is a statement of the gas made, &c., during the year as compared with the previous year:—

Year.	Gas Made.	Gas Sold.	Unaccounted for Gas, or Leakage.	Percentage of Leakage.	Illuminating Power.	Price of Gas per 1000 Cubic Feet.
	Cubic Feet.	Cubic Feet.	Cubic Feet.		Candles.	s. d.
1880	136,192,000	127,667,000	6,229,000	4·59	18·91	2 9
1879	136,036,000	123,142,000	10,797,000	7·94	18·75	2 9

The whole of the works have been maintained in a thoroughly good condition, and your Committee believe that you now possess gas-works which, for completeness and efficiency, may take rank, according to their extent, among the best in the kingdom.

Your Committee have resolved that the sum of £2000—including the annual payment of £200—be paid into the city fund from the profits of the current year.

Water-Works.

The water-works—including filters, pumps, and distributing mains—have been maintained in thorough repair. Your Committee are of opinion that the filter-beds are not sufficient for the purpose for which they were intended; and they have under consideration the desirability of improving and extending the same, on which they hope to be able to report at an early period.

The further efforts to discover and prevent the waste of water have been attended with much success, as indicated in the following statement:—

Year.	Water Pumped. Gallons.	
1879	385,329,361 = 32 0	gallons per head of population.
1880	302,514,208 = 23·6	" "
Decrease	82,815,153 = 21·49	per cent.

The profits having by these means, and by the extended demand for water, been further increased, your Committee recommend that the whole of the profits should be applied to the reduction of the water-works loans, and to the extension of the works as hitherto.

(Signed) Richard Forster, Chairman.

Gas and Water Offices, Oct. 7, 1880.

[The statements of accounts, which were appended to the above report, we shall give in the Journal as soon as they are printed. Suffice it now to say, in reference to the gas-works accounts, that £5705 has been added to capital during the past twelve months, making the total to June last £60,476. The receipts from sales of gas were £17,256; and from residuals, £6873; the balance of the profit and loss account being (as stated above) £5492 18s. 10d. In regard to the water-works accounts, the extensions during the year cost £757, raising the total expenditure to June last to £41,542. The water-rates realized £6667, and the profits were £3172 11s. 9d.]

Mr. Wannop moved, and Mr. Moss seconded, the adoption of the minutes.

The Mayor said the statement was highly satisfactory. Alterations and improvements had been going on for a very considerable time, and the works were now in a most efficient condition. The net profits were £5492, and the way in which the Manager had completed the work with the aid of the Committee reflected great credit upon them. The saving of leakage was something considerable. In most towns it was between 10 and 15 per cent., while in Carlisle it was less than 5 per cent. Therefore, they ought to look on the statement as most satisfactory. He hoped that in future the money paid over to the Corporation would be used for specific purposes. At present it was used up as soon as it came, and nothing was left to carry out the improvement of the town. With such large profits they ought to do something that would be of real and permanent interest.

Mr. Graham said that the sum of £60,000 had been invested in the gas-works, and he wished to know whether, in striking a balance, the Committee would debit themselves with interest on this amount. If they did so, their profit would be a little less than was shown at present.

Mr. Creighton suggested that the annual contribution of the Gas Committee should be invested in the name of some trustees, either in the public funds or in debentures, so that it should not be squandered as it had hitherto been.

Mr. Milburn said the works showed large profits, and he would like to point out that before the Committee declared any profits at all they ought to debit themselves with 5 or 6 per cent. on the capital invested. At present they did not charge themselves with any interest at all. If they paid a fair percentage for interest, their profits would not be so large.

Mr. Moss remarked that though the Gas Committee did not debit themselves with interest for capital they made a large annual deduction for wear and tear. He was anxious that the ratepayers should have some appreciable benefit from the gas profits, as they had always expected it, and the most appreciable benefit would be found in a reduction of the rates.

[Mr. Palmer and others wished to continue the discussion, but the Mayor pointed out that it would more properly come up when the report of the Gas Profits Committee was presented, and it was therefore allowed to drop for a time.]

The motion for the adoption of the minutes was then put and agreed to.

Subsequently, the Committee appointed a year ago to inquire into the subject of the disposal of the profits resulting from the gas supply submitted the following minute:—

"The Committee appointed under the resolution of the Council held on the 14th of October, 1879, find that the moneys from time to time paid since 1877 from the profits of the gas-works to the city fund, amounting to £4480, in addition to the annual sum of £200 in respect of the Mainguard, has already been absorbed in the city fund capital account, and has been expended by the Council in the improvement and extension of the Butter Market, Police Office, and other corporate property."

The discussion previously interrupted was then resumed.

Mr. Palmer said, with reference to the suggestion that the profits of the gas supply would not have been so large if the Committee had debited themselves with interest on capital, that the profits would have been considerably more had it not been that they had now taken land to a considerable extent, which at present they did not use, but for which they had to pay a very large rent. Some people said it did not matter what they paid, as it was only taking the money out of one pocket and putting it into another. However, they paid a heavy rent for a good many acres of land, of which they only occupied a very small portion for one gasholder and the sulphate of ammonia works. They had also expended a large amount on a new gasholder. If they had gone on under the old system their profits would have amounted to £7000 or £8000. The Committee were doing exceedingly well with the works they had under their charge. The appropriation of the money paid annually to the Corporation had been alluded to by Mr. Moss and Mr. Creighton. The money paid over up to the present time had been taken for several purposes, whereas it ought to have been put into a fund and used for some special purpose. It had been observed that the gas-works had not any credit at all. He threw out the suggestion that the Council should take seriously into consideration the idea of lighting the lamps of the town free. This would save the town some £1700 a year, and would take 3d. or 4d. off the rates. It would be better than reducing the price of gas, though if they took 3d. per 1000 feet off it would amount to £1600 or £1700. But gas was as cheap in Carlisle as in most towns in the kingdom; for, in some towns they paid 2s. 4d. for 16-candle gas, while in Carlisle 2s. 9d. was paid for nearly 19-candle gas, so that if the gas were cheaper elsewhere its quality was lower. The former was the better plan, because if they reduced the price of gas the outlying consumers would have the benefit the same as the ratepayers in Carlisle. This was not fair; if any benefit was to be obtained the ratepayers ought to have it.

Mr. Binning moved that the Committee who had made the report then before the Council, should meet again and endeavour to arrive at the best possible plan to adopt in the future as to how the money should be cared for. It was desirable, he said, that the money should be husbanded for the purpose of some great improvement in the town. The best thing would be for the Committee to discuss the right investment for the money in the meantime.

Mr. Bendle seconded the motion, saying probably the money should be invested, but he should like to leave it to the Committee to make a suggestion as to what should be done with it. He had a strong feeling on the subject. He was almost inclined to move that the money which had been absorbed simply into the city fund, and spent without the knowledge of the Council, should be repaid by the Corporation and invested separately. He would not go to that length, but would let bygones be bygones. The money should be kept in a separate fund to be applied to a special object.

Mr. Wheatley said two of the means by which it had been employed were actually paying concerns. They had invested money in the Butter Market, from which there was an annual revenue, and why not take a portion of the revenue as interest on the capital invested? By that means they could pay the money back. Mr. Bendle's suggestion was a very proper one, and he thought a portion of the money, at any rate, should be repaid out of a general fund or a special fund.

Mr. Wright inquired if the interest on the capital account was not due to the city fund.

The Town Clerk said that the money spent on the police office, if it had not been defrayed from this contribution, must have been raised

either by a city rate or by borrowing the money on the corporate property, with the sanction of the Treasury.

Mr. CREIGHTON said the Gas Committee always understood that the money was separately invested. The Committee had often had it under discussion whether they should recommend the Corporation to do something with the money. The object of the Committee more than a year ago was to get something definitely settled, and to have the fund properly put by for some special purpose. The Gas Committee were very much annoyed at the way in which it had been squandered, for it had been squandered, even if it could be gathered together again. He suggested that the Gas Committee should have the power of nominating three members to the Committee already named.

The MAYOR reminded the Council that this was its last meeting, and that therefore perhaps no new names should be added.

Mr. WRIGHT repeated his question as to the payment of interest on capital, and explained that he referred to the interest on capital invested in the gas-works.

Mr. MILBURN said this was what he complained of before, and Mr. Palmer seemed to think he was complaining that the profits were not large enough. They were too large.

Mr. WHEATLEY: They represent the profits as larger than they really are.

Mr. MILBURN said the interest on the capital was really due to the corporate fund. The Town Clerk's offices were not built out of the fund at all. With respect to Mr. Creighton's remarks about the Gas Committee wishing to nominate members, he said that the Gas Committee had no more interest in the fund than any other Committee. All they had to do under the Act of Parliament was to hand over the profits. The profits were due in the first instance to the corporate fund.

Mr. CREIGHTON: I do not deny the fact.

Mr. MILBURN said he thought the corporate fund was entitled to a certain interest on the capital invested. This £1800 which had been handed over was clearly not a fair interest on the capital invested; and whatever the Committee might think, his opinion was that the corporate fund was entitled to a fair interest before the profit was declared. If they paid a fair interest, the profits would not be more than £3000.

Mr. GRAHAM said they were not going the right way in the matter. This was the last meeting of the Corporation, and Mr. Bendle would be taking the thing more vigorously in hand if he proceeded in the shape of a motion. It was proper that the Council should decide the matter, and say how the money should be appropriated.

Mr. BENDLE: I was prepared to give notice of motion, but this will do just as well.

The TOWN CLERK: No part of the gas-works property has been derived from the city fund. The gas-works have purchased and paid for themselves. No part of your property has been diverted to establish and purchase the works, and the extensions have been carried out altogether from the gas-works property. They were originally purchased by the Corporation out of money borrowed on the works themselves, by which the old Shareholders got a payment of so much a share secured by mortgage on the works. It is pure profit to the Corporation from beginning to end.

Mr. MOSS said the capital of the gas-works consisted really of accumulations, and had been derived not from the ratepayers, but from the gas consumers.

Mr. BINNING thought his motion met Mr. Graham's ideas, and was more expeditious. Mr. Graham's suggestion would put the matter off for a month, whereas if his motion was carried they would go vigorously to work at once, and get things put into a proper shape.

The TOWN CLERK read over the constitution of the Committee, which consisted of the Chairmen and Vice-Chairmen of the various Committees, numbering seven in all.

Mr. BINNING said he had no objection to adopt Mr. Creighton's suggestion that the Gas Committee should be specially represented on the Committee. He would therefore give them power to adopt two additional members.

With this modification Mr. Binning's motion was agreed to, the business of the Committee being defined to be "to consider the future application of the gas profits paid over by the Gas Committee to the Council."

OPENING OF THE NEW GAS-WORKS OF THE HEREFORD CORPORATION.

As briefly recorded in the last number of the JOURNAL, the new gas-works which have for some time past been in course of construction for the Hereford Corporation, were formally opened on Tuesday, the 5th inst. The ceremony was performed by the MAYOR (Mr. J. T. Owen Fowler), and among those present were the members of the Town Council, Mr. Ralph (Chairman of the Gas Committee), the Town Clerk (Mr. J. Carless, jun.), the Engineer and Manager of the gas-works (Mr. W. Davis), the City Surveyor (Mr. Cole), and other officials.

At the conclusion of the usual monthly meeting of the Council on the above-named day, the Mayor intimated to his colleagues that the new gas-works were to be opened, and he invited them and the municipal officers to accompany him to the spot. On arriving at the works, which were gaily decorated, the party proceeded to the retort-house, where his Worship threw a piece of coal into a retort which had been lighted for the purpose, his example being followed by the Aldermen, then by the Councillors, and finally by the officials, and the works were thus formally started. Under the guidance of Mr. Davis, the various departments of gas manufacture were then successively visited, the party stopping at the meter and governor house to allow of the performance by the Mayor of the ceremony of "weighting the governor," and sending the gas into the town. This having been successfully done, the company adjourned to the commodious house which has been erected for Mr. Davis, where they partook of his hospitality.

The MAYOR, in a brief speech, congratulated Mr. Ralph, the Chairman of the Gas Management Committee, on the successful completion of the new gas-works, and expressed the pleasure it had given him, as representing the Corporation and the citizens generally, to perform the opening ceremony. He also took the opportunity of congratulating the citizens on the fact that the works had been so ably and successfully carried out by their Resident Engineer. He was sure they would all join with him in hoping that the undertaking would be prosperous and profitable, and he trusted that at the same time they would respond most readily to his call when he asked them to drink the health of Mr. Ralph and the Gas Management Committee, to whose endeavours they were all so much indebted, and "Success to the New Gas-Works."

The toast having been duly honoured,

Mr. RALPH, in responding on behalf of the Gas Management Committee, thanked them all for the flattering manner in which they had honoured the toast. The works had, he said, certainly been a source of some little anxiety to the Committee in their desire to carry them out successfully, but that anxiety had been rendered much less than it would otherwise have been by the fact that they were exceedingly fortunate in having so able an Engineer and Manager as Mr. Davis to carry on the work for them. He hoped the Aldermen and Councillors present had been gratified with their inspection of the buildings and plant; and he ventured to assert that the Corporation and the citizens of Hereford generally had every reason to be proud of the works which had been opened that day, and which were the property of the city. It was as well that the ratepayers, in considering the expense of the gas-works, should remember that the profits arising from the manufacture of gas would be employed for the benefit of the town. A statement had just been made to him which was perfectly correct, and which he thought would so astonish many of the inhabitants of the city that they would hardly be able to believe it. It was that if the old gas-works, which cost £55,000, had to be purchased on a valuation of the profits of last year, the price would be £125,000. He thought there could not now be any possible doubt that the right thing had been done in erecting the new works; and he was sure everybody would agree with him when he said that the town was very considerably indebted to Alderman Anthony for the persistent and able manner in which he had always advocated the course the Council had taken. Had it not been for that gentleman, and the way in which he advocated the purchase of the old gas-works, they would not be gathered together there that day on the very pleasing occasion of the opening of the new works, which were calculated to supply the city with gas, let the increase in the population be what it might, for the next century.

Mr. SHELLARD, in rising to propose a toast, said that when the Gas Company sold the old works to the Corporation, they handed down to them an able and painstaking Manager, and he recollected making the observation that the Corporation would be very foolish indeed if they did not secure the services of Mr. Davis. The Corporation had had the services of Mr. Davis now for a sufficiently long time to know that he was thoroughly competent to carry out the work entrusted to him; and he (Mr. Shellard) was sure that the very able way in which Mr. Davis had carried out, not only the management of the old, but the construction of the new works, had reflected great credit on himself, and had gained for him the entire approbation of all who knew anything about the property on which they were then assembled. The Corporation might congratulate themselves upon having carried out a very great improvement at a moderate cost. Further remarks were not needed from him in proposing Mr. Davis's health, because the company had only to look around them to see the result of his labours. He would therefore ask them to drink health, long life, and happiness to Mr. Davis and his family.

The toast having been drunk with much cordiality,

Mr. DAVIS, in responding, said he could assure all present that the opening of the new works, which had been accomplished that day, was an event he had looked forward to for some considerable time with a great deal of pleasure, mingled at the same time with a large share of anxiety. The frequency of accidents in starting new works had been such as to lead him to be extremely cautious in the operations he had undertaken; and it was with much pleasure, and perhaps he might be pardoned if he added with some little pride that he was able to announce that the works had hitherto been carried out without any mishap. He hoped that as matters had commenced so auspiciously, they might take it as a happy omen that the works would go and prosper; and he trusted that the profits, after gas was sold to the consumers at a moderate price, would be such as to lead to a very sensible relief of the burdens of the ratepayers. He noticed the Manchester Corporation proposed to hand over a large sum of money—over £50,000—to their Improvement Committee, as the proceeds of their gas business. The Leeds Corporation, however, adopted a different principle, and he thought it was really a question for consideration whether the Leeds principle was not the right one. That principle, briefly stated, was not to make profit at all, but to sell the gas to the consumers at cost price. He believed the Leeds Corporation were selling gas now at the low price of 1s. 10d. per 1000 cubic feet. They regulated the price each year by estimating what the profit would be, and settling the price accordingly. In Manchester the Gas Committee proceeded differently, charging a full price for the gas, but invariably handing over a large surplus to the Improvement Committee. On the principle adopted in Hereford, the consumers would have to pay the cost of the works. Not only would they pay the cost of the gas, but they would have to pay the actual capital which, under a company, was never paid off. This sum would be paid off in 30 years, and it certainly appeared to him that during that time they would be burdening the consumers for the benefit of the ratepayers. His firm conviction was that the purchase of the works should have been made by the ratepayers, and then they would have had a claim; but as it was, they had not paid a penny towards the purchase of the works, and this being so, he thought it was the consumers who ought to be first considered. He was afraid, however, that if they were to sell gas at the same price as was done at Leeds, the works would soon be inadequate to meet the consumption. Although the consumption had increased rapidly in Hereford, considering that there were no manufactories in the city to take gas, there still remained a large number of people who ought to use gas, but who did not do so because they did not know its value, not having used it hitherto; and if they could induce these people to burn gas, it would have the effect, not only of increasing the consumption, but also of reducing the cost.

Mr. LLANWARNE hoped he would not be considered out of place in proposing the health of Alderman Anthony. If, he said, it had not been for the line Alderman Anthony had taken, there would have been little or no chance of the Corporation becoming the owners of the new gas-works in Hereford. With regard to the question of distributing the profits among the ratepayers, or giving the consumers the full benefit of them, he thought that perhaps a happy medium between the systems of Manchester and Leeds would be the most suitable for Hereford. They might, perhaps, while giving some little relief to consumers, take steps which would be for the benefit of the ratepayers; but when they were in a happy position of having to consider in which direction their profits should be utilized, they would undoubtedly owe that position to a great extent to Alderman Anthony for the line which he had invariably, and against a good deal of opposition, taken with regard to the gas-works for a great number of years.

The MAYOR having added a few words in support of the toast, it was very cordially honoured.

Alderman ANTHONY, in acknowledging the compliment, said he looked on the opening of the new gas-works as the logical outcome of the purchase of the old ones. Most of those present must be aware that for a very long period he had advocated the purchase of the Hereford Gas-Works by the Corporation. He was sorry to say that for many years his efforts were unattended with success. About 20 years ago negotiations were entered into for the purchase of the old works, but unfortunately they fell through, and he had no hesitation in saying that if the works had been purchased at the time to which he referred, a loss to the city of at least £20,000 or £30,000 would have been prevented. Years passed on, and the project of buying the gas-works was revived under more favourable auspices, and the old works were finally purchased. He was sure that in the future much greater improvements would be effected in the city of Hereford than there had been even in the past, and that at the end

of a certain number of years they would be able to do as was done in Manchester—hand over the profits of the gas-works to an Improvement Committee. They could look forward to the future, and a not far distant future, when the gas-works and the water-works, under good management—and he thought at present they were admirably managed—would yield a revenue that would effect great improvements in the city, and that in the century to come Hereford would march with even greater strides than she had done during the past hundred years.

The company then left the works.

In the evening the MAYOR gave a banquet at the Mitre Hotel, in commemoration of the event above recorded.

The usual loyal and patriotic toasts having been duly honoured,

Mr. J. GWYNNE JAMES proposed the health of the Mayor, and in doing so referred to the admirable manner in which he had discharged the duties of his office. With reference to the event which they had been invited to celebrate, he remarked that he was sure it was one which his Worship would look back upon with a great deal of pleasure and satisfaction.

The toast was drunk with enthusiasm.

The MAYOR, in returning thanks, said it would be a source of great happiness to him, when his term of office expired, if he could feel that he had fulfilled the duties appertaining to it with credit to himself and satisfaction to his fellow-citizens. They had then assembled, as they were all aware, to celebrate the opening of the new gas-works, which had that day been set in operation, and he had had the very great privilege of starting them. He felt convinced that not only were the works necessary to give increased light to the city, but that they would prove to be a source of great profit to the inhabitants. He would, he said, conclude by asking them to drink "Success to the New Gas-Works," coupling with the toast the names of Mr. Ralph (the Chairman of the Gas Committee), the Engineer, and the Contractors who had carried out the works.

Mr. RALPH, who was loudly cheered on rising, said he could assure them that it was a source of great satisfaction to the Gas Committee to know that they had arrived at the time when the works had been actually put into operation, and to be able to state that that night for the first time the town was supplied with gas of the new manufacture. There was no doubt it had been a heavy undertaking. When the Corporation took upon themselves the purchase of the old works, they incurred a heavy responsibility; and they incurred, as many thought, a much larger responsibility when they secured the property on which the present works were erected. When the old works were purchased, the Corporation were somewhat staggered on learning the price that they had to pay for them; and when the award was made it could hardly be thought they would be able to pay the interest and instalments of the amount. It happened, too, at a time when coal went up suddenly from about 10s. to 21s. or 22s. per ton. Practically, however, the old gas-works had not cost the ratepayers a single shilling. Some two or three years ago it was found necessary that additions should be made to the works in order to supply the town with safety. It was only justice to their Manager, Mr. Davis, to say that he had been manufacturing 40 or 50 million cubic feet of gas a year with works only calculated to produce half the quantity. Only those who were acquainted with the practical operations of gas-works could know the anxiety which Mr. Davis must have endured when the gas was being forced through the scrubbers and purifiers in the way it had been. Happily, by the erection of the new works, this difficulty had been got over. When they started with the new works they calculated that they were going to expend some £25,000 or £30,000, and he (Mr. Ralph) believed Mr. G. W. Stevenson recommended, when he was in Hereford, that the expenditure of that amount would give them works which could with safety supply the quantity of gas that was required by the city at present. However, they went on a larger scale than this, and had erected works which could produce double the quantity that was being manufactured at the present time. They took powers to borrow £30,000, and they had exceeded this sum by about £10,000; and he believed the works would cost something like £40,000. He then referred in complimentary terms to the services Alderman Anthony had rendered in connection with the gas question, and passed on to pay a very high compliment to Mr. Davis for the way in which he had conducted the work. He thought every member of the Town Council who had been over the works that day could not fail to be gratified at the manner they had been executed, or to feel at the same time that every shilling which had been expended was absolutely necessary. He could assure them that Mr. Davis had been particularly careful to avoid anything like extravagant or unnecessary expenditure.

Mr. DAVIS also returned thanks. He said the old works were established in 1824, and, after struggling on for some 35 years, in the year 1860 the make of gas was only 20 million cubic feet. At that time the amount had very considerably increased from what it had been, and some additional plant was then put down to meet the existing requirements, and, as it was thought, also for futurity. But in 1870 he found that the consumption had increased to 40 millions, so that in the ten years between 1860 and 1870 the consumption had doubled itself compared with what it had been in the previous 35 years. Passing on to last year, the consumption was 57½ millions, and up to the present time the increase was over 1¼ or 1½ millions, and he had every faith that this year the consumption would be 60 millions, or thereabouts, and that there would be the same increase from 1870 to 1880 as there had been from 1860 to 1870. He then, at some length, proceeded to give an account of the construction of the new works, the progress of which was temporarily suspended in consequence of the electric light "scare." The order to proceed was, however, given in January, 1879, and on Feb. 24 of that year the first tank was commenced. The gasholder would hold 300,000 cubic feet; the retort-house was 114 feet long and 58 feet wide, and there was a railway into the works, for the coal. There were 20 benches of retorts capable of producing 500,000 cubic feet of gas per day. There were two scrubbers 8 feet in diameter and 40 feet high, and two 6 feet in diameter and 40 feet high. There were also four purifiers 18 feet square. There had been used in the construction of the works 2700 cubic feet of Forest stone, 242 tons of lime, 828 casks of Portland cement, 1,400,000 bricks, and 12,000 slates. The new mains cost about £4000, and the additional land and cottages £1375. The city now had gas-works capable of producing double the quantity of gas originally intended. In conclusion, he referred to the fact that the works had been completed without mishap, and said he thought the citizens would agree with him that the Corporation had erected works which were a credit to Hereford.

Messrs. PREECE and GEORGE also responded for the Contractors.

Mr. W. T. STALLARD proposed the health of the Aldermen and Town Councillors, to which Alderman BOSLEY responded.

Other toasts were proposed and honoured, and the proceedings closed.

On the following Thursday the workmen engaged on the new gas-works, to the number of 160 or 170, dined together at the invitation of the Contractors. The dinner was served in the revivifying-shed, adjoining the purifying-house, it having been gracefully decorated for the occasion. The chair was occupied by Mr. P. RALPH, and the vice-chair was filled by Mr. W. DAVIS. The Mayor and several of the municipal officers were present.

The toast of the evening, "Success to the New Gas-Works," was proposed by Alderman BOSLEY, in a speech complimentary of all concerned in the carrying out of the undertaking; and he coupled with it the name of Mr. Davis.

Mr. DAVIS, in responding to the toast, referred to the excellent manner in which the Clerk of the Works (Mr. Williams), the Contractors, the Foreman, and others associated with him in carrying out the undertaking, had performed their several duties. He further expressed a belief that in future the demand for gas for cooking and manufacturing purposes would lead to an increased consumption, which would prove almost as large in the day-time as they were now accustomed to have in the night-time. Should this result occur, one advantage would be that they would be able to use night and day the plant which now was principally used in the night-time, and the consumption would be pretty much the same in the summer as in the winter.

A number of other toasts were then proposed and responded to, and the proceedings, which were of a very enjoyable character, were brought to a conclusion.

BINGLEY IMPROVEMENT COMMISSIONERS GAS SUPPLY.

In the course of his report on the operations of the gas department of the Bingley Improvement Commissioners, during the twelve months which ended June 22 last, the Gas Engineer (Mr. G. D. Malam) states that nothing of a very eventful character occurred to signalize it from preceding years. He then goes on to say that, five years since, when he was appointed Manager of the works, the leakage was 4,200,200 cubic feet a year, or 12·99 per cent. of the quantity made. The annual contraction of the leakage has been as follows:—Gas saved in 1876, 1,684,100 feet; 1877, 2,594,900 feet; 1878, 2,795,900 feet; 1879, 3,051,600 feet; 1880, 3,200,000 feet—total for five years, 13,326,500 feet. This quantity, at 1s. 3½d. per 1000 feet, which was the cost of manufacture and distribution last year, represents a saving to the ratepayers of £860 13s. 4d., or £172 2s. 8d. per annum. The average sale of gas, per ton of coal carbonized during the past five years, has been 9171 feet. The total quantity sold during the last half decade has been 153,427,000 feet, obtained from 16,722 tons of coal and cannel, the average price of which has been 10s. 9d. per ton. The various reductions in price that have been made in recent years, and their effect on the consumers in the way of lightening their gas bills, is thus stated:—

1877. A reduction of 4d. per 1000 feet			£483	18 0
1878.	,,	9d. ,,	1100	5 0
1879.	,,	9d. ,,	1175	17 0
1880.	,,	9d. ,,	1297	8 0
Total			£4057	8 0

Mr. Malam states that the sale of gas last year exceeded that of the previous year by 3,242,000 feet; and adds that, should the sale increase yearly at this rate, additional expenditure will have to be incurred for larger purifiers, station-meter, and holder in place of one defective; larger mains, too, will have to be laid in certain parts of the district.

The Accountant (Mr. J. Pearson) reports the gross profit from the works for the past year to be £4404 12s. 4½d., as against £4220 12s. 1d. for 1879. This amount has been appropriated in the following manner:—Interest on loans, £1511 10s. 7d.; sinking-fund, £915; improvement rates, £850; extension of mains, meters, and services, £573 9s. 7d.; leaving a net balance, if all be collected, of £554 12s. 2½d. for disposal by the Commissioners.

The following is an analysis of the accounts of the gas department for the year ending June last:—

Income.

Consumers and public lamps	34,598,000 cubic feet	£6069	2 0½
Leakage (2·81 per cent. on gas made)	1,000,200 ,,		
Total quantity made	35,598,200 cubic feet.		
Coke		484	2 6
Tar and liquor		554	5 0
Other receipts		63	8 10½
		£7190	18 5

Expenditure.

	Cost per 1000 Feet Made. s. d.		Cost per 1000 Feet Sold. s. d.		
Manufacture—					
Wages of stokers and coalers	0 2·40	..	0 2·46	..	£355 19 7½
Do. of engine tending	0 0·85	..	0 0·88	..	126 14 4
Do. for purifying	0 0·43	..	0 0·44	..	64 5 2
Coal and cannel (3545 tons) and cartage	0 11·18	..	0 11·50	..	1658 18 2
Lime and oxide	0 0 63	..	0 0·65	..	93 10 11½
Tools and materials	0 0·44	..	0 0·46	..	65 18 5½
Maintenance—					
Wages	0 1·31	..	0 1·34	..	194 0 1
Maintenance and repairs of mains, services, retorts, &c.	0 3·04	..	0 3·13	..	451 5 5
Management—					
Salaries	0 2·04	..	0 2·10	..	302 13 11
Wages of meter inspectors, &c.	0 1·21	..	0 1·25	..	179 6 5
Rates and taxes	0 0 97	..	0 1·00	..	143 13 5
Interest on loans	—	..	—	..	1511 10 7
Sinking-fund	—	..	—	..	915 0 0
Balance	—	..	—	..	1128 1 9½
Total	2 0 50	..	2 1·21	..	£7190 18 5
Less residual products	7·00	..	7·20		
	1 5·50	..	1 6·01		

The following further statistics are given:—

Gas sold per ton of coal carbonized	9,760 feet.
Averaging illuminating power	16·75 candles.
Gross income	£7190 18 5
Gross profit	£4404 12 4½
Gross percentage of profit on income	40·23 per cent.
Average charge for gas per 1000 feet within limits	3s. 6·27d.
Ditto without limits	4s. 2 04d.
Length of mains	18 miles.
Gas sold per mile of mains	1,472,455 feet.
Leakage per mile of mains	449,655 ,,
Quantity of gas sold within limits	26,804,200 ,,
Ditto without limits	8,093,800 ,,

At the Ordinary Monthly Meeting of the Commissioners, on Monday the 4th inst., a series of recommendations agreed to by the Gas Committee on the previous Wednesday were reported. The following, among others, were adopted:—"That £400 be paid from the gas revenue fund to the improvement rates;" "that the price of gas within the improvement district be reduced from 3s. 9d. to 3s. 4d., and without the district from 4s. 3d. to 3s. 9d. per 1000 cubic feet, subject to 5 per cent. discount on all accounts under £100, 7½ per cent. above £100 to £150, and 10 per cent. above that amount;" and "that a vote of thanks be accorded to Mr. Malam, the Gas Engineer, for his services during the past year."

SNAITH GAS COMPANY.—The annual meeting of this Company has just been held, and a dividend of 5 per cent. declared, free of income-tax.

SOWERBY BRIDGE LOCAL BOARD GAS SUPPLY.

At the Ordinary Meeting of the Sowerby Bridge Local Board on Wednesday, the 6th inst., in accordance with a notice of motion which had been given,

Mr. HOEY proposed a reduction in the price of gas of 5d. per 1000 feet with discounts as at present. He maintained that direct taxation would conduce to more economical expenditure of both gas profits and rates. It was, he said, pertectly clear to him that the principle of taxing gas consumers to relieve the rates could not stand; and he showed that Sowerby Bridge was charging more for gas than any other public body within a large area. The last balance sheet of the gas department showed a profit of £2069 7s. 8d., and the Board transferred to the sinking-fund £1097 11s., leaving a surplus to deal with of £971 16s. 8d. To this should be added interest reduced to the amount of £177 13s. and a reduction in the cost of coal of £250, and this would bring the estimated profits next year to £1399 9s. 8d. He calculated that a reduction of 5d. per 1000 feet from Oct. 1 to March 31 next year would absorb £655 17s. 1d., showing a balance for the relief of the rates of £743 12s. 7d. If the proposed reduction were agreed to, he thought it likely that the profit would soon be as much as ever, and that next year a further reduction of 5d. might be made. Assuming that coal would advance in price, the price of coke and tar would advance also; moreover, an advance in coal meant better trade, and they now had gas-works equal to an increased consumption of nearly double the amount that was at present required. When the capital now invested was fully utilized there would be a decrease in the interest on the capital of 1s. 3d. per 1000 feet of gas sold; furthermore, the sinking-fund which was accumulating equalled a reduction each year of about another 1s. 4d. per 1000 feet sold. The consumers who were also ratepayers would scarcely feel any difference, for on an average they were rated at about as many pounds as they consumed thousand feet of gas yearly, and if the money that equalled a reduction of 5d. per 1000 feet were taken for the relief of the rates, it would lower the rates about 5d. in the pound. But they had in the district firms who were rated, but who were not consumers of gas; and he (Mr. Hoey) held that for consumers to contribute to the rates from gas profits was simply paying such firms a portion of their rates. Again, assuming that a manufacturer rated at £300 per annum should run short time during the coming winter, and consume no gas, the consumers of gas would be paying £6 towards his rates. Some persons might argue that, instead of reducing the price of gas, they ought to allow the profits to accumulate; but their Act of Parliament distinctly said the profits must be dealt with each year. Besides, if they were allowed to accumulate, the present consumers would be amassing a fortune for their successors. He (Mr. Hoey) thought they were doing quite enough, if not too much, in paying off £1000 of capital each year. It might be suggested that they should reduce the price of gas within the district only; but if they reduced both 5d. per 1000 feet, they would then be charging outsiders about 30 per cent. more than the ratepayers, which any reasonable man must consider enough.

Mr. BATTERSBY seconded the motion.

Mr. SIDDALL opposed it, and said he should continue to be averse to any such change until they had reduced the debt to something like £20,000.

Mr. SENIOR agreed with Mr. Siddall, and spoke of the advisableness of reducing the debt in order that the interest on it might be saved.

Mr. GREENWOOD thought Mr. Hoey had very well stated the reasons for the suggested reduction. At present the millowners and cottagers were called upon to suffer, and such ratepayers as the Canal Company and tenants of warehouses, where but little gas was consumed, reaped the benefit. There was neither justice nor common sense in this. Mr. Hoey's proposition was a reasonable one; whatever the Board did they could not alter that fact. Some millowners let off a portion of their premises—himself among the rest—and the arrangement invariably was that the owner should pay the rates and the occupier for the gas; therefore by the present state of things they did the occupier an injustice. As for the outsiders, he candidly admitted that, if he were living, say, in Ripponden, he would be spirited enough to advocate the manufacture of their own gas; he would not pay Sowerby Bridge 30 per cent. profit on the article.

Mr. CLAY likewise spoke in favour of the motion.

The CHAIRMAN took it the Board were there as the representatives of the ratepayers generally. They had secured gas-works at an enormous cost, and as they had to run all risk of accidents, they were entitled to a fair profit—the consumers had nothing more to do with the matter. He was of opinion that the present rate ought not just now to be disturbed, especially as they were about to undertake great sewerage works. When they had a profitable concern, let them make good use of it; if they gave all the profit away to one class of customers, there would be nothing to divide.

Mr. HOEY briefly replied on the debate; and, on the motion being put, it was lost—only four members of the Board supporting it.

THE PROPOSED PURCHASE OF THE NEWTOWNARDS GAS-WORKS BY THE TOWN COMMISSIONERS.

At a Meeting of the Newtownards Town Commissioners on Wednesday, the 6th inst.—Mr. T. BEATTY in the chair—the question of the purchase of the local Gas Company's works was under consideration, and the reports of Mr. G. Anderson, acting on behalf of the Company, and of Mr. A. Silverthorne, for the Commissioners, were read.

Mr. Anderson's report states that the works have been very well laid out, and most substantially built, and are, in most respects, equal to double the present business. He finds, from the published accounts for the last three years, that an average profit of £741 12s. 2d. has been earned, which multiplied by 16⅔—to which the Company are only entitled, being non-statutory—gives £12,360 2s. 9d. The buildings and plant, however, are able to earn an increased rental, valued at £4044 6s., making a total value of £16,404 8s. 9d., from which there is deducted for depreciation £2130 16s., leaving the present value of the undertaking at £14,263 12s. 9d. Mr. Anderson considers that this sum of £14,263 12s. 9d. is less than it would be on an arbitration, and less than the Company might ask if they were unwilling to sell, but he was informed that they are willing to sell; hence he did not include some items that were sometimes given in similar cases, such as a number of years goodwill, and compensation to retiring officers. These he had balanced against the fact that he considered whoever held the works should reduce the price of gas to 6s. per 1000 cubic feet. Mr. Anderson believes it would be possible to obtain a solvent tenant to lease the works, and supply gas at 3s. 6d. per 1000 feet at the consumers meters, leaving 2s. 6d. for interest on capital invested, which, on only 7 millions, would yield an annual rent of £875. Mr. Anderson concludes thus: "If my valuation goes beyond your expectations, you might allow off a sum of, say, £500 to pay for a thorough examination, more particularly of the service-pipes—for the rental I have indicated would not be earned from your works in their present state."

Mr. Silverthorne considers the works substantially erected, but not in strict proportion to one another in their various parts. He instances the mains as being too large and the storeage as excessive, while the retort-benches and purifying apparatus are only sufficient for the present requirements. Mr. Silverthorne notices that, as usual in small works, they have not been judiciously laid out with a view to duplication, but that the site is sufficient to admit of this being done when, if ever, such an extension is needed. While the works appear substantial, Mr. Silverthorne thinks repairs and renewals have been somewhat neglected. The retort-benches, he says, have been worked with unsound retorts, thus fracturing the beds. After noticing the area of the ground, and describing minutely the different portions of the manufacturing plant, the report states that the storeage capacity—67,850 cubic feet—is in excess of the requirements, and in calculating the value of the undertaking, a liberal allowance is made for this excess. Distributing plant is next dealt with, and Mr. Silverthorne considers the mains to be much larger than they ought to be. There are in all 7775 yards of mains laid. The leakage in the distributing plant is estimated at 27·77 per cent. of the production, and means are recommended for the reduction of this large loss, which is attributed to defective services and the excessive diameter of the mains. Mr. Silverthorne says that, in arriving at a correct valuation of the works, he took as the basis of his calculation the present price of gas (7s. 6d. per 1000 feet), the present sale of gas, the present cost of coals, the present return from residuals, and, as far as consistent, the present scale of working expenses. The price of gas he considers excessively high, and he attributes the diminution in the sale of gas since 1877 to that cause. The report continues:—"Should the Commissioners proceed in the transfer upon the terms indicated here, I have no doubt that renewed confidence in the undertaking will promote an increase in the sale of gas, for it is only on an increase in the sale that the Commissioners could legitimately find the means of reducing the price." Mr. Silverthorne confidently asserts that "the undertaking would develop in time into a remunerative concern to the ratepayers in other senses than by merely providing cheaper gas," which, however, he considers to be essential, as individual millowners and large employers of labour could manufacture their own gas cheaper than it is supplied at present. In estimating the working, Mr. Silverthorne computes that there will be 4,723,657 cubic feet of gas at a uniform rate of 7s. 6d. per 1000 feet sold, £1,771 4s. Cost of coal at the present price, 804½ tons at 16s. 7d. per ton, £667 1s. 3½d. The residuals will realize £187 15s. 4d., thus leaving the net cost of coal £479 5s. 11½d. The total cost of manufacture, including salaries, &c., amounts to £534 9s. 2d. The total net cost of coal and manufacture is therefore £1013 15s. 1½d., leaving a gross profit on gas manufacture of £757 8s. 10½d. From this sum deductions, amounting to £238 5s. 10½d. for bad debts, depreciation in building, and interest on a floating captal of £750, is taken. The remainder, £519 3s., calculated at 16¾ years purchase, amounts to £8652 10s. Deducted for renewing services, £186. The value of the house property is taken at £170, which, with allowance of £750 for extra storeage, makes the net value of the undertaking £9386 10s. Including a floating capital of £750, and £186 for renewals, together with expenses of purchase, £257 10s., the amount required by the Commissioners would be £10,580. If this were borrowed and repaid to the Treasury in 40 years at 3¾ per cent. by annual instalments, the interest yearly would be £514 17s. 10d., which would still leave a balance in favour of the Commissioners from the profit of the undertaking. Mr. Silverthorne says his valuation depends entirely on the Commissioners "taking over the concern free of all mortgage debts or liabilities of any kind whatever." He also recommends occasional advice, as to working, from professional experts, and asserts that without this successful results cannot be expected. The concluding portion of the report is as follows:—"On the terms here indicated the Town Commissioners may confidently acquire the works, but I am equally of opinion that if higher terms had to be given I should certainly not express the same view of the proposed purchase."

After the reading of the reports a desultory discussion arose as to what action should be taken on them.

Mr. WALKER wished to know if the Commissioners could proceed with the negotiations without again consulting the ratepayers.

Mr. RAMSAY did not think the town had anything further to do with the question. The ratepayers had authorized the purchase, and appointed a Valuator whose report was now before them.

Mr. KELLY thought the only thing to be done was to get the money.

Mr. MENOWN said that seeing the great discrepancy in the two valuations—£4000—an arrangement should be come to between the Company and the Commissioners, as to what sum the former would accept for the works—what sum they would concede from Mr. Anderson's valuation. He thought the proper course would be to instruct the Clerk to ask the Company if they would accept Mr. Silverthorne's valuation, or what abatement they would make on Mr. Anderson's estimate.

It was finally resolved that the Clerk should write to the Secretary of the Company, asking him to name a price for the works.

THE LANCASTER CORPORATION WATER-WORKS ARBITRATION.

SURVEYORS INSTITUTE, WESTMINSTER.—MONDAY, OCT. 11.

GARNETT *v.* THE CORPORATION OF LANCASTER.

The arbitration between the Corporation of Lancaster and Mr. Henry Garnett, of Wyreside, as to the amount of compensation to be paid to him for damage done to his land by the Corporation taking an additional supply of water therefrom for the town, again came on for hearing this day. The case has been several times referred to in the JOURNAL, and the facts were fully set forth in the number for Dec. 2 last year (see Vol. XXXIV., p. 858); but they may be briefly recapitulated as follows:—The borough of Lancaster in 1876 obtained an Improvement Act, one part of which related to water supply, which was to be derived from streams rising upon land belonging to Mr. Garnett, a gentleman of property in that part of the county. The area of land was about 15,000 acres in extent, and the Corporation proposed to lay pipes to take water from the streams thereupon, and convey it into Lancaster. Mr. Garnett claimed compensation to the amount of £30,000, and proceedings for arbitration on the matter were taken under the Lands Clauses Act, Mr. J. F. Bateman, C.E., being the Arbitrator. The case came on for hearing at the Surveyors Institute, Westminster, on the 3rd of October last year, but at the outset of the proceedings the Arbitrator intimated that while he would hear any amount of evidence of fact which either side chose to bring, he did not want evidence of opinion. He would, he said, pay every attention to matters of fact, and on these would found his own opinion, and act upon it in giving his award. On hearing this, the senior Counsel representing Mr. Garnett (Mr. Higgin, Q.C.) intimated his intention of withdrawing from the case, as it was impossible for him to go on with it after the observations of the Arbitrator. Mr. Webster, Q.C., for the Corporation, commented on the impropriety of the course adopted by Mr. Garnett, and stated that the Corporation reserved their right to have the arbitration conducted by Mr. Bateman, and to have the award made by him. The Arbitrator referred to the awkward position in which he was placed by the course which had been taken, but stated that he would go on with the arbitration and make his award in writing. The arbitration was accordingly proceeded with on the part of the Corporation, but there was no appearance on behalf of Mr. Garnett. Mr. Mansergh (Engineer to the Corporation), Mr. Swainson (Town Clerk of Lancaster), Mr. T. Fenwick, C.E. (of Leeds), and Mr. J. Newton, C.E., were examined on behalf of the

Corporation, and after these witnesses had been heard, the Arbitrator intimated that he would give his award in writing on the 1st of November following. Mr. Garnett's Counsel thereupon applied to the Vacation Judge (Justice Bowen) to have the proceedings stayed until an application could be made to the Queen's Bench Division to set aside the reference, on the ground that the course taken by the Arbitrator amounted to misconduct justifying such an application. This was accordingly done, and the Court expressed an opinion that it would be better for the parties to agree upon another Arbitrator; for if the arbitration went on as it was, and an award was made, it could not be allowed to stand, a false principle having been adopted by the Arbitrator which went to the essence of the case on one side. On the 18th of the following month the case was again before the Court, when Mr. Garnett's Counsel stated that Mr. Bateman desired to be relieved of the arbitration, of which the plaintiff had undertaken to pay all the costs, and the matter was then dropped, on the understanding that the parties had agreed to submission to another Arbitrator. Mr. Gully, Q.C., was accordingly chosen, and the proceedings were now commenced *de novo*.

Mr. W. H. Higgin, Q.C., and Mr. Horace Browne appeared for the plaintiff; Mr. Webster, Q.C., and Mr. R. S. Wright for the Corporation of Lancaster.

Mr. Higgin, in opening the case, said he could not claim for Mr. Garnett more than he was entitled to by law. The Corporation of Lancaster some time ago took steps to improve their water supply, and for this purpose obtained several Acts of Parliament. In 1832 they had no waterworks, but an Act for their construction was obtained in that year. The first works were of a very simple and primitive character, but they were sufficient up to 1864, when another Act was obtained by which the Corporation were empowered to take 300,000 gallons of water from the River Wyre. By the 1832 Act their money powers were £20,000, and in 1855 they were doubled. Under the 1864 Act a line of pipes was laid through Mr. Garnett's land at Nee Fell and Dunkenshaw Fell to the Tarnbrook Fell, for the purpose of draining those fells. There was no reservoir, and the works had been successfully carried out at a small expense. This Act empowered the Corporation to supply 400,000 gallons of water per day additional from Mr. Garnett's land, and for this privilege he agreed to accept a sum of £100 a year; but the water was to be so taken that there was to be enough left for the flocks and herds and for agricultural purposes. What Mr. Garnett then surrendered was a very different thing from what he was called upon to give up in 1876 by a subsequent Act, which was obtained in consequence of a report by Mr. Mansergh that the consumption of water in 1875 was calculated at 875,000 gallons, and the Corporation had only power to supply 700,000 gallons. He estimated that the amount required 20 years afterwards would be 1½ million gallons, and recommended that provision should be made for such a supply. By this Act new pipes were laid down, and a storeage reservoir was to be constructed to provide against dry seasons. The pipes were calculated to supply 1,100,000 gallons a day from Mr. Garnett's fell land, and his contention was that for the purposes for which this fell land was useful to him those purposes would be entirely defeated and annihilated by the taking of this water. The Corporation were empowered to take from the fell every drop of water they could intercept by this line of pipes, whether the respective brooks were mentioned in the Act of Parliament or not; and it was the belief and part of the case of Mr. Garnett that the operation would render the land lying to the south of the new line of pipes, if not wholly dry, so dry as to be perfectly useless for the purpose for which the land had hitherto been used. The Corporation had increased their taking powers from 400,000 to 2,000,000 gallons a day, of which 1,100,000 gallons was to be drawn from Mr. Garnett's land alone. There was a provision in the Act that care should be taken that a sufficient quantity of water should be left running down the streams for the use of the flocks and herds, for farmhouses and buildings, and for agricultural purposes, and the pipes must be laid and the supply drawn off in such a manner as effectually to secure that object. No attempt whatever had been made by the Corporation to give effect to this section of the Act. Certain small water-troughs had been erected, but they would be useless in any time of drought. If this were the way in which the provisions of the Act were to be carried out, it would be wholly insufficient for the purpose. It was not sufficient to save Mr. Garnett from damage, and therefore he had a right to compensation. After stating that the new Act provided for the supply of Carnforth and other places, the learned Counsel read the notice to treat. It set out that the length of pipe on Mr. Garnett's land was 6805 yards of main-pipe and 1558 yards of branch. This was in addition to the old pipes, and as to the whole of these the Corporation of Lancaster had power to enter Mr. Garnett's land for the purpose of maintaining, renewing, watching, and regulating, and his sporting estate would thus be liable to be visited by the servants of the Corporation at any time. He did not say the Corporation would wilfully harass Mr. Garnett, but this could not be done without hindrance and annoyance. But so far as the land was concerned, an agreement had been come to between the parties, and the question for arbitration was as to the easements and the damage done by taking the water. The easement consisted of the right to dig and excavate for the purpose of laying pipes and repairing and inspecting them, and the right at all times hereafter to come on the land for that purpose. The length of pipe line was doubled, and there would be requisite a double amount of inspection, and the injury would be greater proportionately. The estate was devoted exclusively to sporting purposes, except so far as it was used for the pasturage of sheep, and it was very likely many persons would go there who really ought not to go; and instead of this fell land, where the breeding of game took place, being kept perfectly quiet, it would be liable to great interruption. The game would be disturbed, and the consequence, as he should show by witnesses, would be that the letting value of the estate would be very seriously reduced indeed. Mr. Garnett's whole estate was 11,899 acres, of which 7957 acres were moorland, and part of the moorland consisted of so much of the watershed of 2700 acres as formed part of the estate. The enclosed land was 3872 acres, and at the mansion house at Wyreside there were 70 acres. One of the great points of the estate was that the grouse shooting was perhaps as good as any in England, and certainly better than any in the neighbourhood. It was true that a water-pipe had already been carried through the estate without doing appreciable damage, and with this Mr. Garnett must always have been content. But now it had been more than doubled, and the injury that had been so caused would have to be compensated for in money. If the number of grouse were diminished, it would seriously decrease the letting value of the estate, and this formed one of the grounds of claim in the present case. Mr. Garnett was a country gentleman, a county magistrate, and Chairman of Quarter Sessions. All his interests were thus bound up in Lancaster and the neighbourhood, and all he desired was that he should be compensated fairly and not ridiculously. The difference between what his estate would previously have let for and what it would fetch now was the figure at which compensation should be fixed.

Tuesday, Oct. 12.

Mr. *Henry Garnett*, the plaintiff, described his property as consisting of 7957 acres of moorland, 3872 acres of inland and woods, and 70 acres of park land surrounding his mansion at Wyreside. He had known the estate since 1836, and it had been a shooting and sporting estate ever since he had been acquainted with it. It was superior to other moors because of its excellent supply of water, which was absolutely essential to the breeding of grouse. The Corporation were now taking the water from his moorland springs by pipes. The best breeding-grounds were immediately below the new pipes which had been laid by the Corporation under their last Act.

In cross-examination, witness stated that there were 704 acres of land round his house. This was separated from the moorland, which was about 3 miles distant, and which consisted of 11,700 acres. There were 4212 acres of moorland on the north and 3600 on the south. The workmen laying the water-pipes had disturbed the north moor. Apart from the water-works, the north moor was very much better watered than the south. There were several springs that bubbled up and became running streams. To intercept all the water coming down, the Corporation would be obliged to cut off the whole channel of the water-course or tap the springs. When he walked along the line of pipe recently he did not see a single running stream that he had noticed there before; they seemed to be all intercepted. He did not examine the actual point of interception, but if they had not been intercepted they would have been running across the line of pipes which he followed. He saw two small troughs on the south side of the pipes, and there might have been water in them. He agreed to £30,000 as the amount of the claim. He arrived at it in this way: A rent of £1200 a year at 4 per cent.; he put one halfpenny for every 1000 gallons, and he reckoned 1,300,000 gallons a day. He did not add anything for compulsory sale. His view was that he had a right to sell the water as a royalty, and that he had a right to be paid so much per 1000 gallons. He thought it was his property, being on his land. That was the only basis of calculation that he knew of before the claim was sent in. The whole of the shooting over the 11,000 acres was assessed by the Assessment Committee at £322. On March 18, 1876, he attended before the Committee, and had the rating reduced. He accepted £100 a year from the Corporation for the right to lay the first series of pipes in 1864, but it was a foolish bargain.

Mr. *Patrick Mathew*, C.E., a Surveyor, residing near Perth, said he had visited the plaintiff's moors. Before the laying of the pipes the Tarnbrook Moor was remarkably well watered. He thought the operations of the Corporation would be to take all the water, and grouse could not live without it while breeding. A great portion of the breeding-ground was between the old and the new mains. He calculated the whole breeding-ground at between 1800 and 2000 acres. He understood that the Corporation were going to leave three good springs between Tarnbrook and Oakenshaw Fells. These would suffice for the neighbourhood of the springs, but not for the whole of the moors. Before the springs were taken away the value of the moors was about £1200 a year. He estimated the deterioration in the letting value at £600 a year.

Cross-examined: At 33 years purchase the loss to the plaintiff would be £19,800. He could point out branch-pipes which intercepted the whole of the water from the springs. The fee simple value would be £12 to £15 a year. The whole estate of 11,340 acres was worth £1200 a year to let with the house, which was worth £50 a year.

Re-examined: He had seen the moor both before and after the pipes were put down, and considered it was now materially deteriorated.

By the Arbitrator: His estimate of £1200 a year was for the grouse shooting only. He calculated that 1200 brace a year might be shot. In Scotland moors let at £1 a brace, and this place was more accessible.

Wednesday, Oct. 13.

Daniel M'Intosh, gamekeeper to Sir E. Mackenzie, of Ross-shire, gave evidence as to the value of the estate for grouse-breeding purposes, which, in his opinion, would be materially interfered with by the abstraction of water by the Corporation.

Mr. *T. Statter*, land agent, of Manchester, said he knew Mr. Garnett's estate, and his attention had been drawn to the Corporation Act of 1876, the powers of which were as extensive as they could possibly be. The Corporation had power to take a total of 2 million gallons of water per day from Mr. Garnett's estate and Lea Fell. The land of Mr. Garnett, from which they had power to take 1,300,000 gallons, covered an area of 2700 acres. Supposing the Corporation were able to carry out the works mentioned in the 19th section of the 1876 Act, they could not do so without material injury to Mr. Garnett's estate. After the Corporation had laid their pipes and taken the water they were empowered to take, the moor would be very seriously injured as a grouse moor. Assuming that the Corporation took from Mr. Garnett's property 1,100,000 gallons of water, there would not be left one drop in the dry seasons; and witness was of opinion that the Corporation could not in dry times get anything like the quantity of water that they expected. The piece of moor touched by the Corporation would, in his (witness's) opinion, let easily for £500 a year. He knew that in some districts, in connection with the Liverpool water-pipes, for example, the inspection of the pipes was a great annoyance. The quieter the moors were kept the better for the game, not only during the breeding season, but at all times, and the inspection of this moor by the Corporation officials would do great injury to the moor as regarded grouse breeding. The estates of Mr. Garnett gave a very good range of ground for grouse shooting, and the whole range would let for at least £1000, and probably for £1200 a year. He was decidedly of opinion that the works of the Corporation would do serious injury to the estate of Mr. Garnett as a marketable commodity. As regarded the agricultural land, the abstraction of water would very seriously injure it. In dry weather there would be no water left for agricultural purposes and for the use of the flocks and herds; there was not at present sufficient water for this purpose. He took the line of pipes to measure 7192 yards, and he valued it at 2d. per yard per annum at 25 years purchase, or 4s. 2d. per yard. The branch pipes he estimated at 2s. 8d. per yard. He took it that the moor was depreciated one-third of its value—to the extent altogether of £350 a year. His estimate of damage was made in this way: Depreciation of 7957 acres at £2 6s. 8d. an acre, making £16,523 altogether; taking that sum at 2 per cent. per annum, the annual depreciation would be £530, which capitalized at 35 years purchase gave a sum of £18,550. Then he estimated the depreciation of 350 acres of agricultural land at 5s. per acre, which gave £87 10s., or, at 35 years purchase, £3062. Next were the easements—7192 yards for the main-pipe, at 4s. 2d. per yard, brought £1500, and 1558 yards for branch pipes, at 2s. 1d. per yard, came to £162—altogether a total damage to the extent of £23,274.

In cross-examination, witness said his £1500 was worked out, not at 3s. 4d. but at 4s. 2d.; it was a clerical error. He meant, however, to put it at 4s. 2d., and not 3s. 4d.—4s. 2d. per yard being 2d. at 25 years purchase. He had no calculations at hand in support of his statement that at a certain period of the year there would be no water running down the streams. His own opinion was, that in the dry season the flow of water would amount in 24 hours to 726,624 gallons. This was the dry-weather flow of the district, or, half a foot per second for every 1000 acres. The district was 2700 acres. His calculation was made on the rainfall as given by Mr. Mansergh—viz., 32 inches, spread over the

entire year. He had no information as to the yield of any specific spring, or of the water taken from any of them. As to the grouse question, the breeding-ground for the grouse would not be affected by the abstraction of water from Tarnbrook Wyre at the point to which the new pipes were laid. Assuming the Corporation left a portion of the flow from day to day—that was to say that they never totally intercepted the spring—in fact, if there was as much water left in the stream as now ran down there would be sufficient water for the grouse. If 30 per cent. of the water of each stream was left it would be sufficient.

THURSDAY, OCT. 14.

Peter Melrose, head keeper to Mr. Garnett, said he thought the new line of pipes would do a great deal of damage to Mr. Garnett's estate as a grouse-breeding property. It was in the neighbourhood of the springs that the grouse nested, and it was between the new pipes and Tarnbrook Wyre that the principal breeding-ground lay. He agreed with other witnesses that water was absolutely essential to grouse, and was of opinion that when the pipes were in full operation there would be no water that would find its way below them. There were no regular springs below the pipe line, and he knew of no springs above the old line of pipes except those taken by the Corporation. In dry weather nearly all the moor above the old line of pipes was quite dry. Between the old and the new line of pipes there were twelve springs, and if these springs were cut off there would be no water in the stream beds in dry weather.

Mr. *G. Storey*, an estate agent of Bromley, said he had been over the line of pipes, and had examined the springs. He understood that the Corporation had power to take 2 million gallons of water per day from the watershed. He noticed especially the springs and Tarnbrook Wyre. Assuming that 1,100,000 gallons were taken per day in the driest season from that moor, it would seriously damage it as a grouse moor. Judging upon figures put before him he should think that, if the Corporation took 2 million gallons of water a day they could not leave sufficient to comply with section 19 of their 1876 Act. Even assuming that there was sufficient water left for the flocks and herds, he did not think there would be sufficient for grouse-breeding. He had seen the troughs put down by the Corporation on the line of pipes, and from one of them there was a rill of water flowing which was very soon lost in the ground. That flow of water might be sufficient for flocks and herds, but not for grouse. He had made a valuation of the damage the moor would sustain by the Corporation's water-works, and it amounted to £23,274.

In cross-examination, witness said he had never before made a valuation of this kind, but he had seen Mr. Statter's figures while he was preparing his own, and believed the valuation was Mr. Garnett's.

Mr. HIGGIN here intimated that he was not prepared to proceed further with the case at present.

Mr. WEBSTER protested against the course pursued by the Counsel for the plaintiff.

Mr. HIGGIN said he had simply to consider the interests of his client, and in doing this he should have to call more witnesses, who were not at present prepared to give evidence.

Mr. WEBSTER did not think it was fair, in a case of this kind, to break off in order to get up a fresh case.

Mr. HIGGIN said his learned friend had a case which had, throughout the cross-examination, been studiously kept from his (Mr. Higgin's) knowledge.

The ARBITRATOR said if any information had been improperly kept back on either side, he himself would adjourn the case to any time he might think necessary; but there did not appear to be anything of this kind to complain of.

The further hearing of the case was then adjourned to the 10th of November.

THE RECENT PURCHASE OF THE COLCHESTER WATER-WORKS BY THE TOWN COUNCIL.

A Meeting of the Colchester Town Council was held on Monday last week—the MAYOR (Mr. J. Kent) presiding—when the following report of the Water Supply Committee, in reference to the above-named transaction, was read:—

The first matter will be the carrying out your previous resolution for provision of the money by borrowing on the general district rates the £83,500 sanctioned by the Local Government Board. The several mortgages for raising this sum will be as follows:—For £60,000 to the Public Works Loan Commissioners, repayable by half-yearly instalments over 50 years, and interest at 4½ per cent. per annum; and for £23,500 in divers other sums to different parties, repayable in 20 years, with interest thereon, for the first five years at 3 per cent. per annum; for the second five years at 3½ per cent. per annum; and for the remainder of the 20 years at 4 per cent. per annum, with a contingent increase of ¼ per cent. in the rate of interest in each year during the first ten years in which the net revenue of the Water-Works Company should reach £3200.

It will be seen that, subject to the usual charges for preparing the mortgages and stamps, there will thus be £83,500 available for the purposes of the purchase.

It is necessary next to bring before you the accounts of the purchase-money, interest, and costs claimed by the Water-Works Company, and upon which, after giving credit for income received since June 30, 1879, according to the provisions of the Act, they make a balance due to them of £61,068 3s. 5d.

It will be borne in mind by the Council that on completion of the water-works purchase the Authority will be put into possession of the water-works, and from that time will have the entire control and management, so that all necessary arrangements contingent on the change should be considered without delay.

Mr. GOODY moved the reception and adoption of the report.

Alderman HAWKINS seconded the motion, at the same time expressing his disapproval of the scheme, which, however, he said he was glad to find had come to a satisfactory conclusion.

After a lengthy discussion,

Mr. WICKS proposed that the Mayor affix the common seal of the borough to the conveyance of the water-works property to the Corporation.

This motion was seconded by Mr. PRIOR, and carried unanimously, and the seal was affixed accordingly.

The TOWN CLERK then read the indenture of mortgage to the Public Works Loan Commissioners for £60,000, to be repaid in 50 years.

Alderman HAWKINS moved, and Mr. COLE seconded, that this mortgage be sealed, and it was agreed to.

The remaining £23,500 was borrowed on the following conditions as to interest:—3 per cent. up to 1885, 3½ per cent. up to 1890, subject to the condition that if the net income of the water-works in any one year during that time reached £3200, an additional ¼ per cent. should be paid. During the remaining ten years a fixed rate of 4 per cent. will be paid.

The common seal was then affixed to the 31 mortgages granted for the remaining £23,500, and the indentures were ordered to be handed over to Mr. Bright Wool (the Borough Treasurer). The Committee were also empowered to "act for the Corporation with reference to all such orders on the Treasurer, to draw such cheques, and to do all such further acts, if any, as they may from time to time think requisite."

AT the meeting of the Board of Directors of the Sheffield Water Company on the 11th inst., Mr. William Cockayne resigned the office of Chairman, owing to failing health, and Mr. Percy Smith was appointed in his place.

NORTH OF ENGLAND GAS MANAGERS ASSOCIATION.

(*Concluded from p. 577.*)

Mr. W. J. WARNER (South Shields) read a paper entitled

NOTES ON THE WORK OF PURIFICATION.

Though the theoretical knowledge of the purification of gas has advanced, the practical operations of gas manufacture in this department remain much the same as they were in the earlier days of gas lighting. The same material, too, is as necessary now for complete purification as it was then. Though oxide of iron may do a portion of the work, yet lime must be employed to complete it. So of the apparatus now in use. The old form of vessel, with perforated trays, water-lute covers, and centre-valve, appears to be as necessary now as when the arrangement left the hands of the gifted Malam; and purifiers are not more simple now than then, neither are they more efficient.

Progress, however, has been made, chemical and mechanical, by which the higher standard of purity demanded has been reached. The name of the late Mr. Frederick J. Evans will be ever associated with purification by oxide of iron, as will the labours of Mr. Patterson in defining the work of the two materials employed—lime and oxide.

Mechanically, no individual appears to stand out in bold relief from his compeers. The late Mr. Alfred King, of Liverpool, laboured at this, as he did at every portion of our plant. Of the improvements, we may say the deeper lute and the wooden grids are a necessity in the use of oxide. The latter, however, when used for lime, is an economy that we may claim as an advance in purification.

In the work of construction, and in the mechanical arrangements of manipulation, progress doubtless has been made. In manipulation I include the work of preparing the lime, and putting it into the condition of nodules; and with this I must associate the names of Mr. Forstall, of New Orleans, and Mr. Cleland, of Liverpool. Here we find considerable progress.

The quotation which I will take the liberty of reading from "King's Treatise on Coal Gas" is the greatest proof of this: "Mr. Forstall says: I submit, as the result of actual experience—1. That the granulated hydrate, containing as much water as it can be made to retain without becoming adhesive under careful handling, will purify a much greater quantity of gas per bushel than when in the dry and almost dusty state in which it is generally employed. 2. That in the former condition it offers less resistance to the free passage of the gas through the purifiers. 3. That numerous thin layers of lime can, therefore, be advantageously consolidated into a lesser number of greater thickness, with economy of labour and wear and tear."

Year.	Average Daily Production for December.	Number of Layers of Lime worked through.	Total Thickness of Lime.	Maximum Pressure at Inlet of Purifiers.	Mean Pressure at Outlet of Purifiers.	Cubic Feet of Gas Purified per Bushel of Unslaked Lime in December.	Cubic Feet of Gas Purified per Bushel of Unslaked Lime for the whole Year.	Condition of Lime.
	Cub. Ft.		Inches.	Inches.	Inches.			
1870	959,000	6	12	18	5	7,752	9,053	Dry.
1871	1,010,000	9	27	13	5	11,222	10,000	Dry during half the year.
1872	1,067,000	9	36	15	5	11,854	11,807	Wet.
1873	993,800	9	54	17	5	22,084	17,291	Wet.

As these quotations give only the conclusions and results, I would commend to you the careful reading of the entire article, as well as the whole of the chapters on "Purification" in the "Treatise."

There can be no subject of greater practical value to engage the attention of eminent chemists, or those of the highest attainments amongst ourselves, than this work of purification. Carried as coal gas is, not only into every house, but into the bed-rooms of the youngest children and the most delicate persons—where it is so useful, I may say, so valuable for heat and light, the article should be of the greatest possible purity. Financially, too, the subject is of considerable importance to gas companies, from the frequent pressure of public authorities for a reduction in price with a higher standard of purity and illuminating power. Here, then, is work for men of the highest attainments; and an author of an essay on the work of purification should have, theoretically and practically, that acquaintance with the science of chemistry to which I can lay no claim. The title, however, which I have given to my paper is very broad, and under this I will excuse myself for the shortcomings of my contribution to this meeting.

My notes, then, are of a general practical, rather than of a chemical character; they were suggested by the flattering remarks of Mr. John Pattinson, the able chemist, of Newcastle, who referred at our last meeting to the sulphur question at Shields.

The facts of the case are these: Under our Act of 1867 we had a purity clause of 5½ grains of sulphur per 25 feet of gas consumed, as tested with the Letheby apparatus. The gas was thus tested for the Company, through some of our largest makes, year by year, by one of the leading chemists; but the Corporation did not have any test made. The highest result was 13·30 grains and the lowest 7·33 grains. The Act of 1879 lowered the standard to 20 grains, and prescribed the Referees test. The Corporation then decided to have the gas tested monthly with the illuminating power. The first test was made at the end of the November after the passing of the Act, as soon as the Referees apparatus was fixed, and showed 28·5 grains, much to our surprise, and greatly to our annoyance. Lime only was used, the vessels being 14 feet by 18 feet by 3½ feet deep, with four tiers of trays. They were worked four together, and taken in succession.

I have amongst my notes these three: What was done. How it was done. The means employed.

We were working, as I have intimated, as we had been doing for years, through four purifying vessels in succession, except when we were changing a vessel, then, of course, only three were on. The coal and lime were of the same description as we had used for years, and the men had been employed at the work a considerable time; but there were changes in the work—there was an increased make of gas and an alteration of washers. Over a brief period the sulphur in the gas varied from 20 to 30 grains per 100 feet; it was then brought down to 8·7 grains, and the average to the 30th of June was 10·7 grains, and the lowest through that period 4·9 grains. Since that date it has been 6·2 grains.

How is this done? But a few years ago the reply to this question would have been listened to with great attention. Of course I can give but one reply: By working the vessels in such a manner as to continue some of them in action for a longer period than could be done when they were taken in succession. The first and last vessels in the series were taken more frequently than the two intermediate ones, which became more foul, shall I say? with sulphur; or, in other words, were used as sulphide of calcium, and so were better fitted to take out the bisulphide of carbon—the first taking out the carbonic acid, and the last being a catch vessel given to me by the form of valve used. It is the same as I described

in a paper contributed to the Nottingham meeting of the British Association of Gas Managers in 1867, at which meeting Mr. Hawksley, the Engineer of the Sunderland Gas and Water Companies, was President.

The centre-valve described, which I had devised for the Shields works in 1864, enabled me to overcome the difficulty. The valve is a surfaced one, and has two covers, one above the other, both faced. The under cover may be considered as a section of the body of the valve, with eight ports or cells, one of which is in communication with the centre inlet. The upper cover has three chambers, each covering two of the ports of the under or inlet cover, thus placing, as in the usual way, the outlet of one vessel in communication with the inlet of the next; the outlet chamber corresponding in size and form with the inlet chamber. The inlet and outlet are thus independent of each other, and may be adjusted to put one, two, three, or four vessels into action. Hence the power of taking the first or last vessels in the series more frequently than the others. The outlet cover, being independent, may be changed back to the third vessel to take the fourth; it may then, upon being recharged, be thrown on. The inlet cover may in like manner be changed from the first to the second vessel, and then changed back; both changes being effected without any alteration being made in the other vessels.

I will take the liberty of quoting from my paper of 1867, which I have little doubt is not in the hands of all our members: "Now as to the advantages of the system. It has been said that by working the four vessels an increase of 25 per cent. of purifying surface is obtained. This, however, is true only so far as the setting out of new sets of purifiers is concerned—that is to say, the question then may be whether the arrangement shall be for three or four vessels. If it be decided to have the valvular arrangement for working but three out of the four vessels, then one-fourth, or 25 per cent., of the purifying surface is lost which might otherwise, at least occasionally, be made available; but in the case of old sets of purifiers in action it will be an increase of one-third of purifying surface, or 33⅓ per cent.—an increase that would assist to tide over in comfort many a season that would otherwise be an anxious and a dangerous one. But beyond this there appear to be indications of a positive gain by working the four vessels. They appear to run longer by keeping the dirtiest vessel on longer than usual, which may be done for some time after the second vessel gives a dirty test. If this be so, there will be a saving of lime, and, of course, a saving of labour also. (I am not enabled, however, which I much regret, to lay before the Association a sufficient number of experiments to satisfactorily decide the question.) There will be found also a considerable saving where the condensation is defective, the dirty vessel in such case acting, as it were, as a scrubber, and so preserving for a longer period the lime in the other vessels."

I have a few notes upon the general arrangement of the purifying-house. The form of the earlier purifying-houses with the centre-valve would, there is no reason at all to doubt, be governed by the general arrangement of the apparatus—the four square boxes with the valve in the position that gives it its name. This arrangement, too, would almost be necessitated by the position of the connections, the vessels and valve being placed on the ground. It was not found necessary, however, to continue this practice; so walls were built, the ground was excavated to give access to the connections, and freedom was given to make any alteration of the same. The next step (which I believe was taken by Mr. Alfred King) was to get rid of the objectionable underground chambers, and to raise the whole of the plant above ground. With this alteration the relative position of the vessels could be conveniently changed, and the form of house altered by placing the vessels in line; the connecting-pipes being carried under the vessels to the valve. Leaving out of the question all other matters but the working of the vessels, the advantages of placing them in line are twofold—viz., entire control of the vessels by *one* overhead travelling crane, and the saving of labour and nuisance in disposing of the spent material. These two subjects were kept well in view in designing the Jarrow house.*

As to the first, it was decided that steam power should be employed to work the crane, and having that power, the whole of the work, as far as possible, should be done by it. The covers were to be raised and carried along the house, and the lime or purifying material was to be lifted from below and deposited over the entire surface of the vessel. This work is done by the crane we use, which is driven by an endless rope; indeed, it is still further employed to effect the necessary changes of the valve. We do the whole of the work of changing a vessel 20 feet by 20 feet by 5 feet with two men in about six hours. For the disposal of the spent material, hoppers are constructed on one side of the house, into which the spent material is thrown, and covered down as soon as a vessel is emptied. The lower portion of these hoppers has sliding doors, through which the spent lime is allowed to fall into a cart, and may be removed at once from the place; but in the event of oxide being used, the doors are only partly opened, so as to allow the material to pass down an inclined plane slowly for revivification.

I am afraid I have trespassed upon your time with little original matter. Still I feel assured that if these notes only lead some of our members to direct their attention more closely to this subject, my labour will not have been in vain. Many will yet find in it much of interest and importance. Only last winter I heard that in a good-sized town, upon an occasion of there being an excess of bisulphide of carbon in the gas, all the vessels were changed and charged with fresh lime, which was followed, as you may be sure, by an excess of the troublesome sulphur. As the valve which I invented in 1864, and which I may say, in passing, has been at work ever since, was patented a few months since, and published in the JOURNAL OF GAS LIGHTING, I may presume the subject is still of importance and interest. The distinctive feature of the valve is the independence of the two common ports—the inlet and outlet—and with this independence of action entire control can be had over any number of vessels. There is also another feature which I believe this valve alone has—viz., that when a vessel is thrown off, a current of air for ventilation may be passed through the vessel by opening two slides on the cover of the valve.

I have carefully avoided mentioning the name of Mr. Lewis Thompson, through the course of the paper; but I should not do justice to my subject if I refrained from directing your attention to his early labours in this field, and also to their value. "The Chemistry of Gas Lighting: A Collection of Fragments from Vols. II. and III. of the 'Journal of Gas Lighting,'" is the title of a little work by him, which may be read even now with advantage and pleasure.

I think you will excuse me if I say it is to be regretted that the farmers in this part of the country show so little appreciation of the value of gas lime. Again and again have its advantages been clearly set forth, and yet most of us can realize little or nothing for it. A Professor of Chemistry to the Royal Agricultural Society of England—Dr. Augustus Voelcker—says it discharges the four following important functions:—1. Gas lime exercises a beneficial mechanical effect upon land. 2. It supplies food to plants. 3. Gas lime, by virtue of its alkaline properties, exercises a beneficial effect upon the organic matters in the soil. 4. Gas lime, like quick-lime, has the power of unlocking, so to say, the naturally unavailable mineral stores of plant food in the soil. Again, Mr. Handley, one of our best practical agriculturists, observes that "in many parts of the country where gas-works are established, the refuse has become an object of interest to the farmer, as containing many of the essentials of the most effective manures. The refuse lime, which was formerly an inconvenience to the manufacturers, and was carted away as valueless rubbish, is now contracted for by the neighbouring farmers (in an instance within my own knowledge at 7s. 6d. per chaldron), and applied either in compost or in a direct form to the land, where, in addition to the usual operation of lime, it is said to furnish a protection against many of the noxious grubs and insects."

I have now but to acknowledge my indebtedness to the two Superintendents, Mr. Whyte, of Jarrow, and Mr. Carr, of Shields, for their assistance in this work, and to thank you, Mr. President and gentlemen, for your courteous attention.

Discussion.

Mr. C. SELLERS (York) said that in introducing the subject of purification, Mr. Warner said it was a wide one. It might, he thought, be divided into three parts—engineering, chemical, and commercial. Mr. Warner had dealt with it mainly as an engineering and a chemical question. He (Mr. Sellers) purposed to briefly supplement his remarks upon the commercial side. At York they purified exclusively with lime, and, as lime was admitted by all authorities to be the best means for attaining the highest results in purification, it was desirable that this material should be used wherever practicable. Of course the reason why it was not used was well understood. The foul lime in many instances could not be got rid of except at a cost to gas companies, and this it was which caused gas managers to use other less effective means. At York the refuse lime was readily sold at 5s. per ton, which brought their cost of purification down to a low figure, and, as the details might be interesting, he would give them the cost, based upon the last half year's working; but he might tell them that before their gas passed the purifiers it underwent washing through scrubbers. They found, then, that they used 1 ton of lime to 55 tons of coal, and their lime delivered on the works cost 13s. 11½d. per ton. Following these data, the lime purification of their gas cost 0·42d. per 1000 cubic feet, but deducting the value of the refuse lime, the net cost per 1000 cubic feet was 0·21d., or say 2d. per ton of coal carbonized. This contrasted with a cost of from 8d. to 1s. 3d. per ton in the case of the London Companies, and many provincial companies. Then as to purification, their gas, as confirmed by Dr. Pole, was entirely free from sulphuretted hydrogen, and contained only about 10 or 11 grains of sulphur per 100 cubic feet. This, Dr. Pole stated, was within a few grains of the lowest quantity it was practicable to obtain, and only about half the quantity allowed in the London gas. He knew that the pecuniary results arose from their being able to sell their refuse lime, but he was decidedly of opinion that if efforts were made to push the sale of gas lime amongst the farmers, and educate them by circulars and other means, showing its value and uses for various crops, the same results, more or less, might be attained in many other places. In his opinion gas lime was not appreciated half as it ought to be. He put a paragraph on the top of each of his Company's lime bill-heads, showing its uses and worth, and this had done great good, and he did not see, now that agricultural meetings were so common, why gas managers should not attend them, and advertise their lime. Farmers were not the quickest of men to learn. At one time they would hesitate to come three or four miles to fetch gas lime; but now they sometimes came eight or ten miles, and found it to their advantage to do so.

Mr. W. FORD (Stockton) said he had great difficulty in getting rid of his spent lime, owing to the keen competition of Mr. Sellers, and to the extra railway dues they had to pay, amounting to 3s. 6d. per ton. The farmers in the county of Durham did not seem to realize the importance of gas lime, but he would try to adopt Mr. Sellers's plan, and educate them up to it. He quoted a case in which an Alderman of Stockton expended a large sum over draining an estate, fertilized it with gas manure, and was able to make his farm pay, and realized 10 per cent. upon the capital laid out.

Mr. H. WOODALL (Leeds) regretted that, not having heard more than the concluding paragraphs of Mr. Warner's paper, it was hardly competent for him to enter into the discussion. Still he felt persuaded, from what he had listened to, that it was not intended by Mr. Warner to start a discussion upon the properties and value of waste lime. The valve which Mr. Warner had invented and described was a very ingenious one, but surely, he thought, of but limited usefulness. The ordinary centre-valve for four purifiers was most admirably adapted to the work of purification, inasmuch as the gas, in taking the course as governed by that arrangement, was deprived of its impurities in proper consecutiveness, the lime in the first box acting upon carbonic acid, and in the second upon sulphuretted hydrogen, the third purifier acting as a catch-box; while in most places the changes were so frequent that the fourth purifier could in winter hardly be emptied and refilled before it was required to be in use again. But however good this system might be, it did not comply with the demands of the present day. Gas managers were now-a-days called upon to remove another 10 grains of sulphur from their gas—that was to say, 1 grain of impurity from about 2580 grains of gas supplied; or, to put it in another way, a grain of sulphurous acid less in an atmosphere of not less than 200,000 grains. Consequently, processes had to be multiplied and apparatus duplicated, the latter to the extent of at least 100 per cent. In Leeds it was calculated that the cost of additional apparatus would be about £40,000, and the annual expenditure not less than £5000. He could only hope that when all this expenditure had been incurred there would be no vain regrets. Mr. Warner had paid a well-deserved tribute to the indefatigable Mr. Lewis Thompson, who had so nearly anticipated Mr. Patterson. They were all certainly indebted to the latter for having formulated a reliable method of refined sulphur purification. But in one respect he (Mr. Woodall) had also anticipated Mr. Patterson, who, he believed, had somewhere stated that the genuineness of his patent was established by the fact that nowhere did there exist, prior to the date of that patent, a series of apparatus arranged so as to comply with the requirements of his specification. Now it so happened that on the knowledge derived through Mr. Harris, of Bow, that foul lime was in some way efficacious for the removal of sulphur compounds, he (Mr. Woodall) erected purifiers in three sections, one of which was reserved for lime in a fouled condition. He had removed the sulphide of lime from the third series, and placed it in the first, where it was left a considerable time. This was before the publication of Mr. Patterson's process. Notwithstanding the seven purifiers, however, the gas was very impure. At length the true process was divulged, and within 24 hours it was practically in use at Burslem.

Mr. JOHN PATTINSON (Newcastle) quite agreed with the last speaker that the gas world were largely indebted to Mr. Patterson for unravelling the question of sulphur purification, but it was not yet worked out. With respect to iron purification, he thought it was possible by it to reduce the sulphur to 10 or 12 grains per 100 feet. This was the case in Newcastle about 15 years ago. The test used was Wright's, and the amount of sulphur then would not amount, even by the present system of testing, to more than 12 grains. Of course, they did not attribute this to iron entirely, but to scrubbing with ammoniacal liquor, which had the pro-

* We shall take an opportunity, in an early number, to illustrate and describe the purifying-house here referred to.—ED. J. G. L.

perty of taking up the bisulphide of carbon just as lime would do. But there was still a lot of work to be done in working the purifiers so as to take out all the sulphur that could be extracted, as there was no doubt that one of the great objections to the use of gas in rooms was the quantity of sulphur it gave off in the form of sulphurous acid. He thought the question which had been introduced to the meeting that day was worthy of their most careful consideration.

Mr. V. WYATT (London) was also of opinion that gas should be thoroughly purified from sulphur, so that it might be brought into more general use. With respect to gas lime, and the difficulty of selling it, he thought they might turn their attention to its exportation. There was a great demand for it for certain crops.

Mr. WARNER, in reply, said the South Shields Gas Company could not sell their spent lime, but the fresh lime cost less than in York. The cost at Shields had been as low as 0·36d. per 1000 feet of gas purified. With reference to Mr. Woodall's remarks, there was the fact that the sulphur compounds could not be kept within the standard, though the four vessels were in action; but by the manipulation of the valve—working the first and fourth vessels, and leaving the two intermediate ones longer in action—the bisulphide was immediately brought down to a third of the amount, viz., from 30 to 10 grains. It was a remarkable thing that the first arrangement of a set of purifiers showed four in action; and no doubt with fairly proportioned vessels, with this number in action, the bisulphide could be kept down by working the vessels in succession, as had been the mode of working at Shields for years. As soon as the make exceeded the power of the vessels, then the power was increased by the supplementary character of the valve. And this was all that was needed. The common centre-valve could give no such power or results. As to Mr. Wyatt's remarks, the opinion expressed that gas should be thoroughly purified from sulphur, he (Mr. Warner) could entirely endorse. He then thanked the meeting for the manner in which his paper had been received.

On the motion of Mr. WYATT, a vote of thanks was passed by acclamation to the President for his address, and for the manner in which he had conducted the business of the meeting.

Votes of thanks were also passed to Mr. Jolliffe and Mr. Warner for the papers they had read, and the meeting closed.

The members and associates then, on the invitation of Mr. E. C. Robson, the Chairman of the Sunderland Gas Company, proceeded to the new gasworks at Hendon, and spent some time in an interesting inspection of the plant and apparatus. They were afterwards entertained by the Directors of the Company to luncheon in what will be the sulphate of ammonia house. Mr. Robson presided, and Mr. Stokoe occupied the vice-chair. After luncheon the Chairman gave the usual loyal toasts, which were drunk with enthusiasm. He next gave "The Army, Navy, and Volunteers," which was also duly honoured, and responded to by Colonel Cowen, of Blaydon-on-Tyne. The Chairman then gave the toast of the day, "The North of England Gas Managers Association," with which he coupled the name of Mr. Cox, the President. He said, speaking for the Board of Directors of the Sunderland Gas Company and the Directors whose guests they were that day, he could most sincerely say they were heartily glad to see them on this occasion. The President of the Association acknowledged the toast; and Mr. V. Wyatt gave "The Trade of Sunderland and the District," to which Mr. J. L. Hall, one of the Directors of the South Shields Gas Company, replied. Mr. H. Woodall proposed "Our Hosts," and alluded in high terms to the courtesy shown the Association by Mr. Cox and Mr. Jolliffe, as well as by the Board of the Gas Company themselves. The Chairman and Vice-Chairman responded. The other toasts were "The Press," proposed by Mr. Pattinson; the "Honorary Secretary," proposed by Mr. Sellers, of York, in his usual felicitous manner, and acknowledged by Mr. W. Hardie; "Kindred Associations," given by Mr. Warner, and replied to by Mr. Cameron; and "Our Next Merry Meeting," by the Chairman.

The company then separated after a very pleasant meeting.

SOCIAL SCIENCE CONGRESS.

The Annual Congress of the Social Science Association was opened in Edinburgh on Wednesday, the 6th inst., under the presidency of the Right Hon. Lord REAY, and the business of the various sections was proceeded with day by day until the 13th inst., when the Congress was brought to a close with the general meeting, the customary excursions taking place on the following day. At the concluding meeting of the Health Section—Dr. FARQUHARSON in the chair—a paper was read by Mr. T. IVORY on

THE WATER SUPPLY OF EDINBURGH.

The Author commenced by stating that in consequence of a resolution he had previously brought forward in this section, in regard to giving a supervision of the water supply of towns to the local Medical Officer of Health, he was requested by some leading citizens, who took a deep interest in the health of the city, to bring this matter specially before the Section, and endeavour to persuade them to give a formal, authoritative deliverance to the effect—"That in Scotland the water supply of towns, from its source to place of delivery, ought to be put under the supervision of the local permanent Officers of Health." The object of the present paper was, he said, to persuade the Section to pass this motion. Any one who was not conversant with the subject might not unnaturally suppose that where the supervision of a water supply was committed to such large and unpaid and comparatively responsible bodies as Town Councils and Water Trusts, such a motion as he had proposed for the acceptance of the meeting could not be required; but a very little consideration of the matter would, he was sure, satisfy every mind open to conviction, that the interests of the health of the community could only be properly attended to by adopting the course proposed.

The insufficiency of such bodies as the Town Councils and Water Trusts to secure a proper supervision of the water supply could, unfortunately, be easily explained, and the history of the schemes proposed at various times for the water supply of Edinburgh would be amply sufficient for the purpose. Not to go farther back than ten years, a scheme was promoted by the Town Council of the day, supported by the great majority of the ratepayers, for supplying Edinburgh with water from St. Mary's Loch—a scheme which would have given a supply unlimited in quantity, and of which the quality, whatever its faults might have been, he was sure Dr. Macadam and Dr. Littlejohn would bear him out in saying, would at all events have been superior to the water now supplied from the Moorfoots. But this scheme was defeated by means of evidence which, after it had served its purpose, even those who had used it were compelled to admit was contrary to fact.

To come to the history of the Moorfoot scheme. At the time it was proposed there were two other schemes put forward in competition with it—one for bringing in water from the Manor, the other for bringing it in from the Talla. To state the case in the fewest possible words, the success of this scheme was entirely due to its being hurried through with a high hand, on the basis of statements not only as to the quality of the water but as to the probable expense, not to mention other alleged facts, which, if reasonable time had been given, would have been proved to be altogether erroneous, and which sad experience had unmistakeably proved to have been so. It was in vain that time was asked for sufficient investigation, as it was very specially asked, as the following extract from the proceedings of the Town Council of date May 31, 1874, would show:—"At the meeting of the Town Council, March 31, 1874, Mr. Ivory gave notice of a motion—'That the Town Council resolve not to proceed further in the present session of Parliament with the Edinburgh and District Water Bill, in so far as the Moorfoot clauses are concerned, for the following reasons:—1. The scheme differs in almost every essential particular from that contained in the plebiscite schedule. 2. It has not been sanctioned either by the ratepayers or the Corporation. 3. No means have as yet been adopted sufficient to enable a satisfactory comparison to be made of its merits with those of the Manor and Talla schemes. 4. No means have been adopted sufficient to enable a satisfactory decision to be come to even in regard to its own merits or demerits.'" There were other reasons, based upon the threatened opposition of the riverside proprietors and others, which it was not necessary to go into. He would merely say that the opposition proved more formidable than even he had then contemplated, and the Bill was ultimately only carried by buying it off at extravagant prices. A mechanical majority in the Town Council and the Water Trust voted down all endeavours to delay the progress of the scheme, and to-day the ratepayers were paying the penalty. One instance in proof of the hurried and insufficient way in which the evidence was got up would suffice. It was necessary to prove that one of the important reservoirs scheduled in the Bill had a good bottom for the purpose. The promoters brought witnesses who proved that they had bored the site of this reservoir, and gave evidence accordingly that it was founded on rock. They would, he was sure, be surprised to be told that very soon after the Bill had become an Act this reservoir required to be abandoned, and why? On sufficient borings being made it was discovered that the foundation was not reliable; that it was not rock at all, and that the boring deponed to before Parliament had accidentally struck a boulder. If this discovery had been made before the Bill had passed, he need not tell them that it would have been fatal to the Bill. Let those who were on the outlook for a water supply take warning from the case of Edinburgh, and not be in too great a hurry. "*Sat cito si sat bene*"—quick enough, if well enough—was a good motto in such cases. They would not wonder now why intelligent ratepayers did not consider that they had a sufficient safeguard for the quality of the water supplied in those whose interest it was to put the best face on a bad business, and were of opinion that the supervision of the water supply, from its source to its place of delivery, should be committed to one who had no interest not to tell his fellow-citizens the whole truth—to an independent officer, such as was the present Officer of Health.

A few words now as to the water supply itself. There was a peculiarity in regard to it which he was not aware was to be found in the water supply of any other city. There were, speaking generally, at least three independent sources from which it was drawn—viz., the Pentlands catchment area; the Portmore Loch; and what might be called the Gladhouse catchment area; so that they had three different waters to deal with. But there was another and still more important peculiarity. Not only were these three waters of different quality, but in regard to one of them at all events—viz., the Gladhouse—the quality was, at its best, not only decidedly inferior, but it was very variable, being greatly affected by the kind of weather which might be prevalent. He had said the Gladhouse water was decidedly inferior. There was no doubt that some of those most responsible for its introduction gained over many of the ratepayers by assuring them that it was quite equal to the Pentlands supply, and some persons, he dared say, might be found ignorant enough or hardy enough to assert the same thing now. But he ventured to say that not a single person qualified to pass a judgment on the matter would be found who would assert that the Gladhouse water, by itself, was fit for either domestic or even for manufacturing purposes. As a ratepayer he was entitled to know from the Water Trust whether they could themselves uphold the Gladhouse water as one fit to be introduced alone, and, if so, by what means they had arrived at this conclusion. As a matter of fact they had not ventured to introduce it by itself into any part of the city, but mixed it with the Portmore and Pentland water. The proportions of this mixture had never, so far as he was aware, been communicated to the public, nor had the public been told, as he contended they ought to have been, what districts were supplied with the different qualities of water which were at present sent out. But then it was said by some, no doubt the Moorfoot water was not, when collected and stored, fit for domestic or manufacturing uses; but a costly filtering apparatus had been provided at Alnwick Hill, and surely the water, after it had passed through the apparatus, would be all right. He believed such persons would hear to-day some things which would startle them, and make them alter their opinion. He himself believed, upon authority which he considered perfectly reliable, that however it might do for water of a better and different character, the Alnwick Hill filtering apparatus was quite insufficient to render the Moorfoot water which passed through it fit for the supply of the city. If this were so—and whether it were so or not ought to be made the subject of careful investigation by a neutral expert—the ratepayers, if they were wise, would insist that no money be thrown away on making the Rosebery reservoir in the meantime, and that whatever money might be found to be required to render the Moorfoot water fit for domestic use be, at all events, first raised and applied towards filtration. He believed, further, from facts which had come to his knowledge, that if the complete history of this filtering apparatus, and what had come out of it since its construction, were given to the public, a general feeling of disgust would be the consequence, and many of the more timid of the community would hardly venture to drink the water again. He could say for himself that, previously to the introduction of the Moorfoot water, he was proud of the water of Edinburgh—it was bright, clear, colourless, and inviting. Now it was altogether otherwise; in particular, it was tinged with a decidedly peaty colour as supplied to many parts of the city, and far from inviting-looking. He used to consider the water a luxury to drink, and he drank a good deal of it. Now he had always a feeling of misgiving when he drank it, and consequently took as little of it as possible. The stuff which came out of the filters when they were cleaned had often been not only very noxious, but offensive to four out of the five senses.

He had been informed on trustworthy authority that there was in the Water Trust somebody who was mainly responsible for this unsatisfactory state of matters, and for the withholding from the public of information which most reasonable men thought it was material that the public should know, and for the consequent prolonged irritation felt by a very large portion of the community. If the motion he had made were carried and given effect to, then he was satisfied that this state of matters would be speedily brought to an end, and a harmonious and satisfactory solution of their water difficulties be ensured.

He concluded by venturing to offer a practical suggestion. Would it not be a good thing to construct one or more test cisterns or catchwaters

at such points as might be thought best? He believed that were such a plan adopted, the examination of their water supply would be considerably facilitated.

A long discussion followed the reading of the paper, and eventually the motion was put to the meeting and carried by 20 votes to 2.

SANITARY INSTITUTE OF GREAT BRITAIN.

When commenting, in the "Water and Sanitary Notes," in a recent number of the JOURNAL, on a paper read at the Congress of the above-named Institute lately held in Exeter, reference was made to a communication by Mr. F. P. PERKINS, the City Analyst of Exeter, on "The Sanitary Condition of Wells in Exeter and the Neighbourhood." The paper in question was as follows:—

This is not the first time that the wells situated in or near Exeter have formed a theme for writing or discussion. In Dr. Shapter's "Climate of the South of Devon" is an interesting account of many of the natural springs and wells of the neighbourhood, and in the "History of the Cholera in Exeter," by the same author, the closing of certain wells of the city, which at that time were considered impure, is mentioned. In older works, too, devoted to the doings of ancient Exeter, frequent allusions are made to the then important subject—the maintenance in proper condition of the wells of the city. The aim of this paper is not so much to deal with their past history as to show the connection existing, or which is frequently established, between health and disease by means of wells (often nothing but mere pits for the reception of drainage water and contaminations of the worst kind), to show that it is often best, putting a new construction on an old adage, "to leave the well alone."

I have had the opportunity of examining many wells, both in the city and out of it, and the analyses I selected were from the worst and the best specimens of water analyzed. The first on the list is from a farm not far from Alphington. The water was freely used for drinking, for household purposes, for the cattle, for washing butter, &c. Ill-health prevailed. The free ammonia vastly preponderated over the organic, while the chlorine was also high; the water evidently belonged to the ureal class, and fresh sewage was constantly percolating into the well. The next examples are from the village of Alphington, where the drinking water is far from being good. The analyses from a couple of wells situated very near each other, resemble each other closely—both show a large proportion of nitrogen as nitrates and nitrites. I have been informed that these wells are not far from the churchyard. At Topsham the wells near the River Exe are extremely foul, but in higher situations there is good water. Cases of fever were not unfrequent in the lower regions, brought on, without doubt, by drinking the river impurities which had filtered through to the wells. Another analysis I made at Topsham was that of a horrible specimen; the water contained so much salt as to taste of it.

Coming nearer to Exeter, on the Topsham Road, about half a mile from the city, there is Parker's Well, formerly in estimation as a holy well. Whether the small proportion of iron it contains did act beneficially on the pilgrim's sight, or whether it was merely the invigorating walk and the coolness of the water, is open to question. However, analysis shows it in a favourable light. The water is as clear as crystal, and contains but few impurities past or present. Just below this well, and close to the river, is one which is rather notorious—a well from which it was proposed at one time to draw a supply for the city, and which had been stated to be artesian. This assertion had evidently been founded on an observation by Sir H. De la Beche; but the frequent disturbances of strata which have taken place in the neighbourhood of Exeter entirely preclude the idea of an arrangement favourable to the sinking of an artesian well. The boring is stated to be less than 100 feet deep, the supply constant; but that it is derived from a distant outcrop, and filters through the sandstone, is impossible. This statement is confirmed by the analysis, for water that had filtered through such a depth of sandstone could not contain such an amount of organic matter. It would have been almost entirely oxidized. Its bright and sparkling appearance is deceptive, for, looked at through a deep stratum, it is turbid, and has a tint of yellow. Much of it, doubtless, is river water that has found its way through natural crevices in the rock, and the organic matter shown here as organic ammonia is the remains of Exeter sewage. In St. Leonard's are wells which have been spoiled by sewage. Both the organic ammonia and the chlorine show that the water is filthy, and fever has resulted from its use. There was a specimen of fairly good water from the same district, and not 200 yards from the contaminated wells.

I now go towards Pennsylvania. At Egerton Park and at the terrace above good water is found, but at a villa under it is unfit for use, the drainage being defective. The Lion's Holt supply has long been known as superior. The well of St. Anne was formerly the supply of Exeter. In the "History of the Cholera in Exeter" is a note stating that "as early as 1221 this water was brought into the city from its present sources in the upper part of the parish of St. Sidwell, and delivered by a conduit erected in the centre of the High Street below the Quatrefois." In 1346 it is mentioned as "conveyed into St. Peter's yard," whence, Dr. Oliver informs us, "it branched into three channels, one for the use of the members of the Cathedral, another for the City, and a third for St. Nicholas Priory." During the cutting of the London and South-Western Railway the springs were seriously damaged, but even now the water brought down to the city and the Cathedral is supplied as in olden time. It proved to be a good, cool, pleasant water, showing but little organic matter. Rather above this well, in Well Lane, just under York Buildings and close by the St. Sidwell's Churchyard, is a public well, which in "days gone by" was doubtless as pure as the fount of St. Anne, but it has lost its reputation, and is now closed, as analysis showed it to be teeming with impurities, probably a solution of ancient parishioners. In the high ground of Posloe Road the water is naturally good, but traces of recent contamination having been discovered, the well was examined, and a dead cat was pulled out. At Heavitree Bridge, very close to the brook flowing by the little village of East Wonford, is a spring, in which the water is still good. The brook is also now nothing better than an open sewer, giving off its foul emanations, and poisoning the air of one of the most beautiful walks in the neighbourhood—viz., the Wonford Fields.

Of the city wells but little good can be said; the soil there is saturated with impurities, which find their way into the wells. "Beautiful water, and preferred to any other," is said of many a specimen which when analyzed proves to be a mass of corruption, and on inquiry it has generally been found that if there has not been fever the people using it are what is called "ailing." Not one of the old public wells within the city yet examined yields good water.

On the same occasion, "The Ventilation of Water-Mains" was selected by Mr. STEPHENSON as the subject of a short paper, of which the following is the substance:—

The author presumed it would be conceded that, given a collection of good water in a tank or reservoir, it was equally pure whether it was discharged into a constant service system or an intermittent one, and also that the dangers inherent in an intermittent water supply had so far nothing to do with the water itself, only with the system, thanks to the imperfect details which were still permitted to be carried out, and the rival results of former faulty systems. The question was how to obviate those dangers if possible. The great danger of the intermittent system arose from the tendency of the system, where the supply was turned off, to produce in the water-mains and service-pipes a vacuum, the result being that they became rapidly filled by suction power, or rather the external pressure with a leakage of air and soakings from more or less impure sources. Were the mains and service-pipes and taps all good and efficient, this leakage would not be so dangerous, but unfortunately they were not. As it was, the risk was the absorption of foul gases into the water, rendering it a suitable fluid for the production of diarrhœa, enteritis, or fever. He would propose to combat this great danger of intermittent systems by ventilating the mains from above, and by introducing a V-shaped pipe as an anti-suction valve at the junction with every house-pipe or other outlet. He would propose, at a point immediately below the cut-off cock, to introduce a ventilating-pipe, which could be led up the side of a house, or be fixed to a post at such a height and in such a position as to admit pure atmospheric air. While the ventilating-pipe at the head of the main would admit a free supply of fresh air to the system, the V-pipes, being full of water, would prevent the admission of any air or gas from houses or closets, or any other outlet of the water system. The ventilating-pipe without the V-pipes would not suffice, for when the water had run out the system was filled with air, the temperature of the dwellings and underground being greater than that of the outer atmosphere, there would soon be a backward current of air established, with the consequent risk of the inhalation of impure gases. A constant water supply was necessarily vetoed on account of the expense, so it remained for science to help "the powers that be" out of the difficulties which finance imposed upon them.

THE EDISON ELECTRIC LIGHT.

(FROM OUR AMERICAN CORRESPONDENT.)

The October number of the *North American Review* contains an article on "The Success of the Electric Light," by Thomas A. Edison—an article replete with assertions, but unaccompanied by figures. Mr. Edison opens his paper by commenting upon the impatience with which the public have been waiting to see his lamp in successful competition with gas, and says that though it is some months since the announcements were made in the papers that his lamp was perfected, that all obstacles in the way of supplanting gas were removed, and the subdivision, almost *ad infinitum*, of the electric current was an accomplished fact, yet the public had not seen the fulfilment of these promises.

After noting the adverse criticism which men of science have passed upon his invention, and likening it to the opinion expressed by many eminent men when the subjects of steam navigation, telegraphy, &c., were broached, the writer goes on to state that his system of electric lighting has, in fact, been a success from the first, and the delays which have occurred are not attributable to any defects in the various apparatus, but have been occasioned by the great labour required in arranging the details, and establishing the system upon a commercial basis as a substitute for gas.

Mr. Edison next says that the generator and lamp which he first proposed to use, could have produced a cheaper light than that obtained from gas, and would have been as effective and as easily managed. The delay, however, which has been occasioned by the difficulty in arranging the details of the system has been taken advantage of to effect many modifications both of the lamp and of the generator. Though having previously asserted that the lamp had been a success from the first, the writer states, with amusing calmness, that the lamp has been completely transformed; that the external form—in other words, the globe—of the two lamps is the same, but in the perfected lamp incandescent carbon is substituted for a platinum wire wound on a spool of zircon; thus a softer light is produced. It would seem that charred paper is no longer used to make the carbon loop, as Mr. Edison states "it is prepared from the fibre of a cultivated species of bamboo from Japan." A thread of this substance having been treated chemically, is bent to the required form and carbonized; and a very tenacious loop is obtained, one well adapted to withstand such concussion as it would be subjected to in daily use. The life of a carbon loop is placed at six months, allowing it to be in use five hours a day. The cost of the lamp is given as 50 cents (2s.). The amount of light given by the lamp is stated to be equal to that of an ordinary gas-jet; it is also claimed to be a steadier and purer white light than that produced by gas. The writer states that the heat emitted is one-fifteenth of that occasioned by gaslight of equal illuminating power. "A sort of meter" indicates the amount of electricity passed into each house.

Having thus enumerated the improvements of his perfected lamp over its predecessors, and its advantages over gas, he states that dynamo machines have been substituted for magneto machines, and closes his description of the lamp by affirming that "the limit of economy, simplicity, and practicability has been reached."

As to the future, it is stated that a demonstration of the working of the system will probably take place at Menlo Park before the close of the year. Further, that preparations are being made for introducing the system of electric lighting in all the chief cities throughout the United States; the towns are being mapped out, and contracts made for the manufacture of the apparatus. As to the price at which the light is to be supplied, the inventor states that the figure will be so low as to make competition on the part of the gas companies impossible.

In conclusion, it is claimed that the companies will be able to make such a profit from the supply of electricity for power, as to cover the expenses of running the stations during the lighting hours.

I have given you a brief *résumé* of Mr. Edison's article—a paper that resembles all that have hitherto emanated from Menlo Park, being rich in assertions, but devoid of figures. It is not necessary to comment on the article; let your readers take it at its value. Suffice it to say that it has not created any particular stir in the gas world on this side of the Atlantic, nor even had any effect on the quotations of gas stock.

SALE OF SHARES IN THE BRIGHTON AND HOVE GAS COMPANY.—On Wednesday last, Messrs. Edwin Fox and Bousfield offered for sale by auction, at the Mart, Tokenhouse Yard, E.C., 50 fully paid £20 shares in the above Company. The shares were put up in ten lots, six of which were bought at the rate of £26 5s. per share, the remainder being disposed of at £26. The total amount realized by the sale was £1307 10s.

THE GAS SUPPLY OF NEW YORK.—The number of gas-lamps in New York on June 30, 1880, was 23,394. The miles of gas-mains in the city on Dec. 31, 1879, were 860. There were used in the public buildings last year 13,737,860 cubic feet of gas, costing 26,122 dols.; the cost of lighting the public lamps in 1879 was 420,677 dols. There are 92,848 meters in use. About 3,660,244,900 cubic feet of gas were made in 1879, in which year 654,818 tons of coal were carbonized.

FURTHER NOTES ON PETROLEUM SPIRIT AND ALLIED LIQUIDS.

By Mr. A. H. Allen.

[A Paper read before the Chemical Section of the British Association at Swansea.]

At the Sheffield meeting of the Association,* I laid before this Section the results of some experiments for distinguishing commercial petroleum spirit, or "benzoline," from coal-tar naphtha, or benzene. I have since extended the experiments to the "shale naphtha," obtained as a secondary product of the manufacture of paraffin wax and burning oil from the bituminous shale of the south of Scotland.

In physical properties shale naphtha presents the closest resemblance to petroleum spirit, both liquids being known in commerce by the same names and used for similar purposes. They are also usually stated to be identical in chemical composition, and hence I supposed that the reactions which I had found characteristic of petroleum spirit would be equally applicable to shale naphtha. Experiment has shown certain differences in the behaviour of the two liquids with reagents which point a much wider divergence in their chemical composition than is commonly suspected to exist.

The following table exhibits in a convenient form the physical characters of the volatile naphthas from petroleum, shale, and coal tar, together with the differences observed in their solvent action on coal-tar pitch and anhydrous crystallized carbolic acid:—

	Petroleum Spirit.	Shale Naphtha.	Coal-Tar Naphtha and Benzol.
a. Leading constituents.	Heptane, C_7H_{16}, and its homologues.	Heptylene, C_7H_{14}, and its homologues.	Benzene, C_6H_6, and its homologues.
b. Sp. gr. of sample at 15·5° C.	0·690	0·718	0·876
c. Boiling-point of sample.	55° C.	56° C.	80° C.
d. Solvent action of the sample on coal-tar pitch.	Very slight solvent action. Liquid only coloured amber yellow, even after very prolonged contact.	Behaves similarly to petroleum spirit.	Readily dissolves pitch, forming a deep brown solution.
e. Behaviour of the sample on agitating three measures of it (cold) with one measure of fused crystals of absolute carbolic acid (Calvert's No. 2).	No apparent solution. The liquids are not miscible. [For further details of this reaction, see Allen's "Commercial Organic Analysis," Vol. I., p. 317.]	The liquids form a homogeneous mixture.	The liquids form a homogeneous mixture.

From this table it appears that while shale naphtha presents the closest resemblance to petroleum spirit as regards its specific gravity, boiling-point, and solvent action on pitch, it is sharply distinguished from it by its behaviour with carbolic acid, in which respect it resembles coal-tar naphtha, or benzene. The carbolic test is not applicable to mixtures of the various products, as in such cases the phenol passes readily into complete solution. In its limited solubility in rectified spirit, shale naphtha resembles petroleum spirit, and differs from benzene, which is miscible with alcohol in all proportions.

As the carbolic acid test had shown a sharp distinction between the more volatile products from petroleum and those from bituminous shale, it appeared interesting to apply it to the burning oils obtained from different sources. The samples of burning oil compared were a specimen of American petroleum, or "kerosene," of 0·800 sp. gr., boiling at 166° C.; and one of shale oil, or "photogene," of 0·801 sp. gr., boiling at 170° C. Both samples required 16 or 17 volumes of methylated spirit for complete solution, and gave with coal-tar pitch light yellow liquids, having a greenish fluorescence. Carbolic acid, employed in the proportion already described, was found not to be miscible with either kind of oil in the cold, but the petroleum product caused it gradually to assume a deep purple, and ultimately a black colour. This reaction was repeatedly obtained, but I am unable to say whether it is peculiar to the few specimens hitherto examined, or is a test which might be generally applied to distinguish petroleum kerosene from the similar product from shale.

Correspondence with a friend engaged in the paraffin industry, and to whom I am indebted for much information and various samples of shale products, gave me the clue to the differences observed in the behaviour of shale oils and petroleum oils with reagents. The explanation lies in the fact that while the naphtha and burning oil obtained by the distillation of petroleum consist chiefly of hydrocarbons of the marsh gas or paraffin series, having the general formula C_nH_{2n+2}, the similar products of the distillation of shale consist largely of hydrocarbons of the ethylene or olefine series, having the general formula C_nH_{2n}. This difference in composition is clearly indicated by the behaviour of the various liquids with fuming nitric acid and with bromine. Thus, while 100 measures of petroleum spirit, when treated with fuming nitric acid (sp. gr. 1·45), concentrated sulphuric acid, fuming sulphuric acid, and caustic soda, employed successively, yield at least 75 measures of unchanged oil, shale naphtha on similar treatment leaves but 15 to 30 per cent. of paraffins. Similar differences are observable in the case of the burning oils, that from petroleum yielding from 55 to 80 per cent. of paraffins, while from shale photogene the unchanged oil is only 35 to 40 per cent. Repetition of the experiment shows that the process is capable of yielding results agreeing within 2 or 3 per cent., and sometimes much closer.

The different susceptibility of petroleum and shale oils to the action of nitric acid is borne out by the difference in the facility with which they combine with bromine. The results obtained in this way are very remarkable, and conclusively show the predominance of olefines and other unsaturated hydrocarbons in shale products, these readily decolorizing many times the volume of bromine which can be caused to combine with petroleum naphtha or burning oil. I have strong hopes of basing a simple quantitative method on this well-known principle.

In petroleum spirit I have repeatedly found traces of benzene and its homologues, as indicated by the production of aniline. Shale products, however, appear to be wholly destitute of this series of hydrocarbons. I am informed that while chrysene is produced largely by the distillation of shale, anthracene is met with in but very insignificant quantity, and naphthaline appears to be entirely absent. The lubricating oils produced from shale consist almost wholly of olefines, the paraffins of high boiling point being solid at ordinary temperatures, and hence they are separated in the form of paraffin wax.

The following table shows roughly the differences in chemical composition between commercial petroleum products and the bodies of similar physical characters obtained by the distillation of shale, as deduced from the action of nitric acid on the oil. In order that the results might be comparable with those obtained from copper, the same quantities of metal and oil were used—viz., a piece of polished iron exposing 8 square inches of surface, this being immersed in 500-grain measures of the oil under examination. The samples thus prepared were kept in glass dishes, and agitated daily during the whole of the exposure, which extended over 21 days. The appearances were then noted, and determinations of iron made in each by the colorimetric method, using potassium cyanide as the reagent:—

Product.	Petroleum.	Shale.*
Naphtha or spirit; sp. gr. about 0·700; boiling-point about 56° C.	At least 75 per cent. of hydrocarbons of the paraffin or marsh gas series, C_nH_{2n+2}. The remainder olefines, C_nH_{2n}, with distinct traces of benzene and its homologues.	At least 60 to 70 per cent. of hydrocarbons of the olefine or ethylene series, C_nH_{2n}. The remainder paraffins, C_nH_{2n+2}. No trace of benzene or its homologues.
Photogene, or burning oil; sp. gr. about 0·800; boiling-point about 160° C.	55 to 80 per cent. of higher members of the paraffin series, C_nH_{2n+2}. The remainder chiefly olefines.	60 to 65 per cent. of higher members of the olefine series, C_nH_{2n}. The remainder paraffins C_nH_{2n+2}.
Lubricating oil.	(?)	Almost wholly higher olefines, C_nH_{2n}, the paraffins of similar high boiling-point being solid. No naphthalene.
Wax.	Solid paraffins, C_nH_{2n+2}.	Solid paraffins, C_nH_{2n+2}.

* Since this paper was written, I have found reason to question the accuracy of the quantitative results here given. But whatever be the true proportion of unsaturated hydrocarbons, they are present in far larger quantity in the shale than in the petroleum products.

Remarkable occurrences rarely come singly. Last week, says *Money* (a City financial paper), the greater part of the South London suburbs was in a state of terror for several days, through an unfounded rumour that a raging lion had escaped from a travelling menagerie, and was lurking upon the tracks of stray schoolboys, late postmen, female post-office clerks, and any other tempting morsels he might have the chance to devour. This week it is the irrepressible and horrible Stock Exchange bears, who for the third time have inaugurated the season of long nights by coming round with their white sheet on a pole, surmounted by a scooped-out turnip to represent one of the electric lights on Waterloo Bridge, and frightening all the nervous old ladies and timid old gentlemen into selling their gas shares for fear of a tremendous panic and fall that is sure to arrive in the City some day very shortly, and just when nobody is supposed to expect it. In other words, a combination is at work to make money out of those who are foolish enough to be alarmed or intimidated by mischievous rumours, as the "bears" succeeded in too many instances in doing last autumn and the autumn before, notwithstanding the warnings that we, and the rest of the press who were not included in the fraternity, gave to our friends not to be led away by unscrupulous wreckers, who care not how or from what source they filch their dirty gains so long as they get them. In 1878 it was "Edison is coming! He has done the miracle! It's all up with gas and gas shares! Electricity in every room in your house as soon as he arrives, for all but nothing!" But the time came and went, and, as we predicted from the first, there was no Edison, and would not be until he or somebody else had mastered the apparently insoluble problem of finding a metal that could withstand for hours together the wondrous consuming power of concentrated lightning. Last autumn we had another scare upon a milder scale, though it passed off with much less serious consequences; but from the frequent recurrence of concerted "bearing" operations of this and other equally groundless kinds, it seems evident that the division find enough silly and misguided persons every time to make the experiment more or less profitable. It may be so again to-day, though we would hope not, for there is not a whit more reason why the public should play into their hands and encourage them in their dishonest schemes now than there was two years ago. The attempted scare this time is to be founded simply upon the fact that the authorities are making arrangements for some trials of the light to be made in certain public places where expense is altogether a secondary consideration to public efficiency and convenience, and where the constant flickering that has hitherto been found inseparable from the electric system of illumination will be of comparatively trifling importance. But there is nothing whatever in this to reduce the value of gas shares, which are a good and improving property, and any temporary depression that may be caused by exceptional substitutions of the electric light for gas in certain large buildings will be far more than compensated for by the increased demand for gas for cooking and lighting purposes for the many hundreds of new houses that are annually added to the Metropolis and all the principal cities and towns in the kingdom. For anything yet made known to the world the old impracticable difficulty with the electric light remains exactly as Sir Humphry Davy described and lamented it 75 years ago, and until that difficulty is got over, to listen to the mercenary and interested twaddle of the "bears" and their friends, and to act upon it at a sacrifice, is simply and unmitigatedly absurd.

The Gas Supply of Prestwich.—At the meeting of the Prestwich Local Board, on Wednesday last—Mr. J. H. L. Beaufort in the chair—the Clerk reported that a requisition had been received by the Chairman asking him to convene a meeting of the owners and ratepayers of the district to consider the question of the price of gas supplied by the Radcliffe and Pilkington Gas Company, and whether it was desirable to procure a supply elsewhere. The Chairman said the Board had endeavoured to obtain a reduction in price, but had failed. Mr. Harding said under the altered circumstances of the price of coal it was only reasonable that some steps should be taken to secure a reduction in the price of gas or a fresh source of supply. The charge of the Radcliffe Company was 5s. per 1000 feet, whereas the Salford Corporation only charged 3s. 7d. per 1000. On the motion of Mr. B. Heape, seconded by Mr. J. G. Clayton, the Chairman was requested to call a meeting of owners and ratepayers in pursuance of the requisition, on the requisitionists giving security as to the payment of the expenses in accordance with the Public Health Act, 1875.

* See Journal, Vol. XXXIV., p. 497.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The Executive Committee of the Exhibition of Lighting and Heating Apparatus, &c., have now completed their arrangements for instituting a complete series of tests on the merits of the various exhibits which have been entered for adjudication. There are no fewer than ten classes of exhibits in which entries have been made, and consequently this number of Committees of Jurors has been appointed; and at a meeting of the Executive Committee held on Friday, the reporters or conveners of the several Committees were selected. The following are the names of them:—I. Electric Lighting Appliances—Mr. J. T. Bottomley, F.R.S.E., University of Glasgow; II. Gas Lighting Appliances—Mr. W. Foulis; III. Gas-Meters, Governors, &c.—Dr. Wm. Wallace; IV. and V. Cooking Appliances and Heating Appliances—Mr. J. L. Bruce, Architect and and Civil Engineer; VI. Gas-Engines and Air-Engines—Mr. St. John V. Day, C.E.; VII. Oil Gases, Secondary Products, &c.—Mr. J. J. Coleman, F.C.S.; VIII. Water Appliances—Mr. James M. Gale, C.E.; IX. Ventilating and Sanitary Appliances, &c.—Mr. H. K. Bromhead, I.A.; X. Safety Lamps, Mining Appliances, Fire-Clay Goods, &c.—Mr. Ralph Moore, H.M. Inspector of Mines. In no case are the jurors more than six or fewer than three in each Committee. It is expected that there will be well-nigh 100 individual exhibits or collections of exhibits on which the jurors will have to adjudicate and report. Partly with the view of eliminating applications in respect of only meritorious objects or collections, it was found advisable to institute a small entry fee—10s. for each motor, and 5s. for each other exhibit—an arrangement which exhibitors readily fell in with. It is most probable that the exhibition may be kept open for five days longer than the original intention of the Committee—the closing day being Saturday, the 30th of October, instead of Monday, the 25th. There are now no fewer than four electric lighting firms or companies showing in the exhibition, the latest to come on the ground being the Anglo-American Electric Lighting Company, with the "Brush" system of dynamo-electric machines and lamps, sixteen of the latter being worked from one machine. On Friday and Saturday nights there was quite a flood of electric beams in that portion of the exhibition hall specially set apart for electric lighting.

Certain members of the Town Council of Glasgow, in addressing the electors in the wards which they represent, have, during the past week, referred to the gas question. One member of the Corporation Gas Committee told his constituents that the revenue of the Gas Commissioners during the past financial year amounted to £340,000, and the expenditure amounted to £257,000, showing a balance of £83,000, which was carried to profit and loss account. The price of gas had been reduced to 3s. 8d. per 1000 cubic feet, and the speaker was hopeful that in the course of the ensuing year a further reduction in price would be made. The Gas Trust was in a most flourishing condition. Bailie Finlay, another member of the Gas Committee, went even further than that. After stating that the price of gas had been reduced from 5s. 5d. to 3s. 8d. per 1000 cubic feet within the past six years—equal to an annual saving of £105,000 to the community—he said that next Whitsunday there would probably be another drop of 2d. per 1000 cubic feet; when the Glasgow gas consumers would be burning the cheapest gas in the United Kingdom. There had been spent in branches, mains, and additions to the works during the past six years the sum of £60,000, all of which was taken from revenue. He further pointed out the good quality of Glasgow gas—26 candles—and the fact that the Corporation supplied the meters free of charge and kept them in good repair; and he considered that the advantages which he had mentioned were at least equal to a reduction of 4d. per 1000 feet of gas. An Edinburgh paper hopes that Bailie Finlay's expectations will not be lost sight of at the approaching ward meetings in the "Modern Athens." Councillor Drow, also a member of the Gas Committee, told his constituents that there had been sold and accounted for last year 1,577,446,000 cubic feet, or an increase of 2 per cent. over the amount sold and accounted for in the preceding year; and he mentioned that the total value of the gas-works belonging to the Corporation was rather more than £1,000,000 sterling. There is a proposal afloat just now which aims at taking a sum of £5000 from the funds of the Gas Trust, and handing it over for the general purposes of the Corporation.

The new portion of the gas-works at Broughty Ferry having recently been completed, it was reported at the last meeting of the Police Commissioners that the works had been started on the 4th inst. The works having been examined by the Commissioners, the machinery was set going, and so far as could be tested in a short trial, was found satisfactory.

Edinburgh and Leith gas stock was sold last Thursday at £35 10s. per share; and on the following day the Aberdeen gas annuities were sold at from £6 4s. 9d. to £6 5s. per share.

A fair home trade is doing in Scotch pig iron, and the Continent is taking iron more freely in order to have it forwarded before the season closes. The market closed on Friday with buyers at 50s. 4½d. cash and 50s. 7d. one month, and sellers asking 1d. higher per ton.

The coal trade is continuing to improve, and the price of gas coal is advancing.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

An improvement is certainly noticeable in the coal trade of this district, so far as round coals are concerned, but there is still no actually pressing demand in the market, and with the collieries working a little extra time they are able to raise quite sufficient coal to meet present requirements without interfering with stocks. Best Wigan Arley at the pit mouth is quoted at about 8s. to 8s. 6d., with lower qualities and good Pemberton four-feet at about 6s. 6d. to 7s. per ton.

In the gas coal trade there is very little actual buying going on, except where small quantities are required for private firms and mills; but there is an increased quantity now being delivered from the collieries on account of contracts, which has a tendency to give a firmer tone to prices where any inquiries are made. For good Wigan district gas coal at the pit mouth the average price now quoted would be about 6s. 3d. per ton. A fair quantity of gas coal is at present going away for shipment.

Common round coals for iron-making and general manufacturing purposes are more or less a drug in the market, and for these very low prices have to be taken, the quotations at the pit ranging from 4s. 9d. to 5s. 6d. per ton, according to quality.

Engine classes of fuel are in steady demand, and although there is now an increased production of slack, this has not yet had any material effect upon prices, which remain at about 3s. 9d. to 4s. 3d. per ton for burgy, and 3s. to 3s. 6d. for good slack at the pit mouth.

For coke there is a moderately fair inquiry at late rates, which at the ovens remain at about 9s. to 12s. per ton, according to quality.

The iron trade has been extremely dull, and amongst some of the makers there has not been much disposition to quote until the result of the quarterly meetings just held has been ascertained. There is, however, generally a weakness in prices, with an absence of demand on the part of consumers, who are in want of very little iron, whilst those who have to come into the market only buy from hand to mouth. Lancashire pig iron delivered into the Manchester district is nominally quoted at about 47s. 6d. for foundry, and 46s. 6d. for forge qualities, less 2½ per cent.; but makers are not firm holders at these figures. Bar iron delivered into the Manchester district is quoted at about £6 to £6 2s. 6d. per ton, but less money would be taken for prompt specifications.

The winter session of the Manchester Scientific and Mechanical Society was opened on Friday evening by a meeting at the Industrial Exhibition now being held at the Pomona Gardens, and Mr. C. Bailey, in noticing the gas exhibits, referred to the great development which had taken place in the application of gas to various purposes. He did not think they need anticipate that, for the present at least, gas would at all suffer by the competition of the electric light, which was only suitable for lighthouses or for large spaces, and holders of gas shares need not have any fear on the score of their property being depreciated in value.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Though a slight improvement may be reported in the state of the coal trade in this district, yet things are dull, and but little animation is noticeable in comparison with what has been witnessed at this season of the year. A slight falling-off is reported in the demand for iron-making fuel, owing to a decrease in the number of furnaces in blast, and to a check in the finished department. Prices remain the same as have been quoted for several weeks past, and, although no alterations have been made in any respect, increased rates are urged by the men with a view to higher profits, and an increase in miners wages. An increase is perceptible in the output of the Cannock Chase pits, and the shipping tonnage is much greater than it has been for several months. There is a fair call for gas coals, and most of the cheaper qualities of the neighbourhood. Coke is in better request at firm rates.

The iron trade has not as yet shown any material improvement since the alteration of rates took place, but, on the contrary, remains as in the case of the majority of brands, for the depression has to some extent increased. The many inquiries made at the quarterly meetings appear only to have been made with the object of testing prices, for nothing of importance has transpired in connection with the finished iron trade. South Staffordshire brands of marked bars are now reduced 10s. per ton all round, and all-mine pig iron is likewise reduced 5s. per ton. Hot blast pigs are now quoted at £3 to £3 7s. 6d., and cold blast at £4 to £4 5s. Part mine is also cheaper, the average rate being £2 10s., while cinder pigs remain at £2.

But little business has been transacted on the £7 10s. basis for marked bars, though sheets and plates are perhaps in demand. Rods and strips are more sought after at the reduced rates. The demand on foreign account is considered to be on the decline. This is especially the case in the American market, where a perceptible difference has taken place. As an increased demand is, however, reported from the Cape and a few of the colonial markets, things will not be serious. The call for galvanized sheets is still good, and may be said to be the best feature in the export trade. Prices, too, are firm in all classes. A reduction is again to be reported in the number of blast furnaces at work in the district. During the last three weeks some half-dozen furnaces have either been damped or blown out, and at the present time there are but 46 in full work. This number is, however, in excess by 20 of the numbers in blast in the corresponding period of last year. Heavy iron founders, edge tool, and tube makers are fairly well employed.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Almost all branches of the finished iron trade remain quiet, although some of the works seem to be better off than they were a short time ago. Many of the foundries where ordinary castings are produced are doing but a limited business, but those producing large gas and water-pipes, and apparatus belonging to the former branch, are fairly off for orders. There is about an average tonnage of pig iron produced and sold by the various firms engaged in the trade. Very little ironstone is sent out from the local pits, there being a large influx of ore from North Lincolnshire. The make of Bessemer steel rails and tires holds well up, and the breakdown at the Yorkshire Steel and Iron Works, at Penistone, has been got over, and work resumed.

The steam coal trade is in a pretty good state, considering the period of the year arrived at. The tonnage sent to Goole and Hull from the West Yorkshire collieries is about an average one. From the pits in the South Yorkshire districts the Hull trade is well sustained, and there is a fair tonnage forwarded to Grimsby, which port is easy of access to that part of the coal-field. Prices, however, do not increase, nor are they now likely to do so this season. A fair amount of smelting fuel is also being sent to Barrow and some other markets.

For ordinary coal the demand is only limited, or, in other words, the output is far in advance of the consumption. Some of the pits are said to have intimated their intention of advancing prices; but it is to be feared this movement will be with difficulty sustained, owing to the competition which has to be encountered. The demand for both Silkstone and Barnsley thick-seam coal for London is only moderate. The returns show that the Great Northern carried from eight of the leading pits working the Silkstone seam only 11,000 tons, of which the Birley Colliery, near Sheffield, furnished nearly half. This was a falling-off when compared with the tonnage of the previous month, upwards of 13,000 tons being forwarded from the same pits. Only about 10,700 tons were sent from the thick-seam pits, and of this the Carlton Main Colliery furnished the largest tonnage. From the St. John's and New Sharlstone Collieries, in the West Yorkshire district, upwards of 8000 tons were sent. A fair tonnage was also placed on the Midland line by collieries on both sides of the coal-field.

Other kinds of fuel, including gas, locomotive, and manufacturing coal, are only in about average request. The contracts for the supply of all kinds of coal are easily executed, even although the pits are only working about three and four days per week. Considering the large output of coke, there is a tolerable business passing. The owners of furnaces in North Lincolnshire and the Barrow districts are giving a good share of attention to the South Yorkshire coke, which, although not so good as that from the North of England, has of late been much improved, and in some instances has been freely used.

The labour market is in a very curious position. Singular to say, the West Yorkshire miners agreed, through their Secretary, Mr. W. Pickard, to accept a reduction of 2½ per cent. during the next four months, according to the fifth clause of the sliding scale agreement; yet at the very time this was being done, the South Yorkshire miners delegates were met in private to consider the desirability of demanding an advance of wages. The conference, however, turned out to be abortive, and the only resolution agreed upon was that a circular should be issued to the masters, asking them to advance the price of coal, and give the men an increased rate of wages.

A good deal of interest is being taken in the affairs of the Silkstone and Dodworth Iron and Coal Company, Limited, and hopes are entertained that, inasmuch as they find employment for nearly 1000 men and boys,

the pits will be kept going. Mr. R. Hartley, the Manager of the firm, has been appointed provisional liquidator. It is satisfactory to state that the threatened dispute at the Hoyland Silkstone Collieries, where a large tonnage of capital gas coal is raised weekly, has been bridged over, the men agreeing to certain matters, as to an allowance for taking out the riddles, being submitted to arbitration. With regard to the Thorpe Gawber Hall Collieries, Limited, at a private meeting of the Shareholders, held last week in London, various suggestions were made to put the Company on a better footing; but nothing definite was come to, and in the meantime the collieries, which have been standing since the 29th of September, are still idle, although the make of coke is going on.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The gas coal trade is busy. The shipments by steamers to London and coastwise have been a full average over the past fortnight, though the supply of tonnage has been rather short. Upon the whole the business doing in coals in the North of England continues to get stronger all round. House coals are doing much better than they did. There has been a rise in the value of that class of fuel of from 6d. to 1s. per ton over the fortnight. This upward movement of house coals will help second-class gas coals somewhat; but though trade is not so dead as it was a couple of months ago, the improvement is only comparative; and if anything like a steady business can be transacted this side of Christmas, without any great advance in prices even, most people concerned in the coal trade will be satisfied. In October, as gas and house coals come to the front, steam coals begin to occupy a secondary position. The price of steam coals has not been upheld. The shipments to the East Indies by large vessels were good last week, otherwise this trade would have been very moderate. Manufacturing coal is plentiful and in fair demand, and the same may be said of coke.

The coasting market was not very well supplied with sailing tonnage last week. Freights are higher, but in no instance do they get beyond a rise of from 6d. to 1s. per ton upon the business transacted over the summer. Some small vessels continue to derive an advantage from return cargoes, which help the coal freight in many instances, especially when they can be had in the North of France. The shipments of gas cargoes to the Channel are pretty steady, but the tonnage taken up for Ireland last week was small. Gas coals are being sent off to the Baltic to complete the stocks for the winter, and some cargoes were shipped last week in steamers for the Mediterranean, mainly for the station gas companies.

Iron founders, especially in the manufacture of heavy castings for marine engines, are moderately well employed. But though they quote low for other descriptions of work, they fail in securing many fresh orders. Prospects do not appear to be extremely favourable for the winter. A large concern or two at Middlesbrough are executing good orders for pipes; but, as a rule, the water and gas pipe trades are not very busy. In the general business of iron manufacture, prospects have been better since October came in, and there is more confidence in the future. Buyers have been anxious to purchase. This largely applies to plates and angles, and that description of work. Pig iron showed an advance of about 6d. per ton last week.

With the exception of soda, which has been sold in rather large parcels, at £3 2s. 6d. per ton net, the chemical trade of the North of England gives no manifestations of revival. Ash is low in price, and in poor demand, and the same may be said of the other articles offered for sale.

The fire-clay goods trade remains in a somewhat dull condition. This is especially so of second-class sorts. The large concerns are still completing their orders, and they do not complain of a lack of business; but less favoured establishments continue to add to stock. The deliveries of wood are moderate, but they are quite enough for the requirements of trade. A quiet—indeed, a dull business is transacted in lead. Copper, and other metals of that sort, are very little changed in value.

Working men keep well employed in the North. Wages of all sorts of labourers are upheld.

PROPOSED PURCHASE OF THE BOURNEMOUTH GAS AND WATER WORKS BY THE LOCAL BOARD.—The Bournemouth Local Board have, it is stated, appointed a Committee to consider the desirability of purchasing the gas and water works in the town.

LLANELLY GAS COMPANY.—The half-yearly meeting of this Company was held on Friday last—Mr. W. Thomas in the chair. The Directors recommended a dividend at the rate of 5 per cent. per annum, and this was agreed to.

THE WATER SUPPLY OF EPPLEBY (YORKS).—A meeting of the ratepayers of Eppleby was held on Wednesday last to consider the desirability of bringing an additional supply of good water into the town. It appeared, from a statement made out by the Overseer, that 21 out of 63 houses were short of good water—a proof that this important commodity is wanted.

POLLUTION OF THE THAMES AT WOKINGHAM.—On Tuesday last summonses were heard before Mr. King (Chairman), Mr. J. Walter, M.P., and a full bench of Magistrates, at Wokingham, against the Wokingham Sanitary Authority, for polluting the Thames by permitting sewage to be discharged into the Kennet close to its mouth, and thence into the Thames, within the district of the Wokingham Sanitary Authority. Mr. George Payne represented the Thames Conservancy Board, and Mr. G. A. R. Fitzgerald (instructed by Mr. Wheeler, Clerk to the Wokingham Sanitary Authority) appeared for that body. The Magistrates held that the notice said to have been served on the Authority was bad, and dismissed the case, the Chairman, however, remarking that they hoped the case would be taken to a higher tribunal.

LOCAL GOVERNMENT BOARD INQUIRY AT HINDLEY.—On Wednesday last, Major Tulloch, one of the Inspectors of the Local Government Board, held an inquiry at Hindley with reference to an application by the Local Board for power to borrow £28,216 for works of street improvement, £6000 for gas purposes, and £1500 for works for the treatment of nightsoil. The Ratepayers Association opposed the borrowing of the money on the ground that the rates were very heavy, and that the additional loan would entail a rate of 9d. in the pound. It was suggested that, in lieu of borrowing, an extra rate of 6d. in the pound per year should be laid to provide funds to carry out the proposed improvements. The Inspector said he did not agree with the suggestions of the Association, because it was not fair to saddle the present inhabitants with the cost of improvements which would be of benefit to future generations. It was explained that a portion of the amount required for gas purposes and street improvements had already been spent, and that the Board intended to construct works on the best principle for dealing with the refuse of the township.

THE SEWERAGE OF BRADFORD.—The Bradford Corporation having applied to the Local Government Board for sanction to borrow £30,000 for works of sewerage, and £40,000 for providing for the purification of the town refuse, an inquiry into the subject of the application was held at the Town Hall, Bradford, on Thursday last, by Mr. R. Morgan, C.E., one of the Inspectors of the Local Government Board. The Town Clerk (Mr. W. T. M'Gowan), the Borough Surveyor (Mr. J. H. Cox), and Mr. C. Gott were present on behalf of the Corporation. The Town Clerk explained the system of the sewage works, which, he said, had been inspected by a great many local authorities, who were very flattering in the opinion they expressed upon it. By the system adopted the waters were thoroughly and effectually purified. Some of the sewers in respect of which the money was applied for had already been formed, but others, for which the borrowing of money had been sanctioned, had not been completed. The total amount already borrowed for sewerage was £200,000. Of this sum £30,000 was borrowed in 1875. The Inspector drew attention to the fact that while the estimate of the cost of the sewers was £31,865, only £30,000 was asked for. At the suggestion of the Town Clerk, the amount of the loan required was altered to £32,000. The Town Clerk then referred to the question of the purification of the town refuse. For this purpose the Corporation asked for £40,000. They had chosen two suitable sites, but they had no funds to carry out the work, and they wished that the loan applied for should be granted for 60 years. There being no opposition, the proceedings, which were of a purely formal character, terminated.

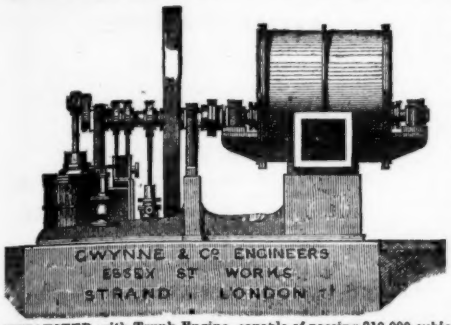
THE WATER SUPPLY OF EXETER.—During the recent Congress of the Sanitary Institute in Exeter, Dr. Bartlett, in a lecture to working men, referred to the probable effects tainted river water from below Tiverton might have on the water-drinking inhabitants of Exeter, in the event of a cholera epidemic. The *Exeter Gazette* of Friday last contained a communication on the subject from "one of the most eminent members of the Sanitary Congress, of greater experience and authority than Dr. Bartlett, or any other sanitarian, with respect to the water question." The communication was as follows: "One ounce of fact may be worth more than a ton of speculation. That which happened in another place may be instructive to Exeter. During a raging cholera epidemic in Bilston, Staffordshire, where about one-tenth of the population died, the excreta was thrown on to the surface, or into drains, which washed down into the River Tame, which river also received the surface washing of the intervening Black Country above Birmingham, and where cholera also prevailed. The supply of water for Birmingham was, without filtration, pumped from water impounded from the Tame, but no case of cholera originated in Birmingham; so that germs, in this case, did not fructify. The Exeter people should, nevertheless, compel Tiverton to clarify all the sewage, and the Exeter Town Council should also deal with their sewage, so as not to be a nuisance to the citizens of Exeter, or to any one else below. River water should be freed from pollution, and should also be well and properly filtered under all conditions, and from the filters it should pass to covered service reservoirs, then direct to the water-mains, and from these, by service-pipes, to every house and single room, if used as a tenement. The river water will be the best, because it will be the most abundant and cheapest supply, and may be sand-filtered so as to be clean, clear, and wholesome."

IMPROVEMENT IN STREET LIGHTING AT SOUTHAMPTON.—Last Saturday's *Southampton Times* says: "Those of our readers who on Thursday or Friday evenings last passed through the main thoroughfare at the upper part of the town could not fail to have been struck with the largely increased amount of light emitted by the new burners recently affixed to the lamp columns in that vicinity. These new burners, together with the handsome lanterns enclosing them, have been fixed at the expense of the Southampton Gas Company, and under the direction of their Manager, Mr. S. W. Durkin. They consist of two of Sugg's patent flat-flame burners, of 100 candles power each, and six ditto of 50 candles each. The lanterns are of the pattern known as the 'Lambeth.' They are light and elegant in appearance, and by a judicious application of the principles of reflection fully utilize the illuminating power of the light. The 100-candle burners have been respectively fixed at the junction of the Commercial and New Roads with the main thoroughfare, and the six smaller burners in the intervening and adjacent spaces. We understand that the object of the Directors of the Gas Company in fixing these burners is to continue the experiment commenced in the early part of the year 1879, to afford practical proof of the efficiency of gas lighting for the illumination of large open spaces and of localities where no auxiliary aid can bederived from the lighting of business establishments, &c. These burners, singly, are not so powerful as the large Argand previously fixed at the end of the Commercial Road, and which is now used by the Dock Company to light that part of their premises where the business connected with the Continental and Jersey traffic is transacted, but are, nevertheless, a vast improvement upon our ordinary mode of street lighting."

STOCKTON AND MIDDLEBROUGH CORPORATIONS WATER SUPPLY.—A correspondent of the Newcastle Chronicle writes: "As the period draws nigh for parliamentary notices, the position of the water supply of the Stockton and Middlesbrough district becomes more interesting. It is yet doubtful whether the Water Board will be allowed to go to Parliament for amended or additional powers. It is stated that the cost of the Act by which that Board acquired the works and undertaking of the old Water Company was not less than £27,000; that the cost of the arbitration to define the value was £10,000; and that in addition a stamp duty was paid of £3400; so that with so heavy a cost it is scarcely probable that the ratepayer owners of the works will be ready to enter into another parliamentary contest. But something needs to be done. There is still the same objection to the source of supply of the water. Its purity is at least open to question, and it is certain that water pumped from the Tees is water supplied by a much less economical method than that which is supplied by gravitation. The Water Board is under obligation to construct immense works, but with the heavy loss on the carrying on of the works, even after a large increase in the rates, it is exceedingly improbable that these works will be carried out in their entirety. Meantime the demand for water is increasing, in the old limits of the Board, and in that portion which they are now beginning to supply. It is stated that last year the average quantity of water pumped was about 50 million gallons weekly—or about 10 million gallons less than the maximum quantity. The exact figures for the current year have not been allowed to transpire, but it was stated in April 2 million gallons weekly more were drawn than in the corresponding period. There has been a large increase in the consumption at iron-works since then, and the population has grown, so that it may be assumed that the margin between the quantity drawn and the maximum that may be drawn is small now. Hence the Water Board needs to face the question how to meet that growth in the demand that seems certain. Parliament has more than once decided that it will not increase that maximum, and as Darlington also draws its supply from the same source, it would be unadvisable in the interests of the river. Hence that simple, if objectionable, method of meeting the difficulty is out of the question; and as the ratepayers are unlikely to allow the immense work the Board has power to undertake to be begun till there is a probability of the present loss on the supply being done away with, the Board will be in a dilemma between the wants of its customers and its statutory powers. Probably it will have early to undertake some of the smallest of its meditated reservoirs, so as to increase its supply at as little cost as possible, relying on the growth of the district in the future to minimize the burden that ratepayers have to bear."

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

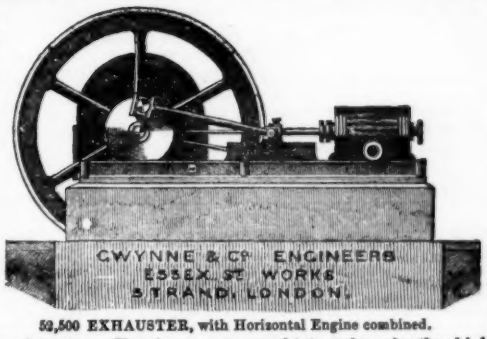
GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

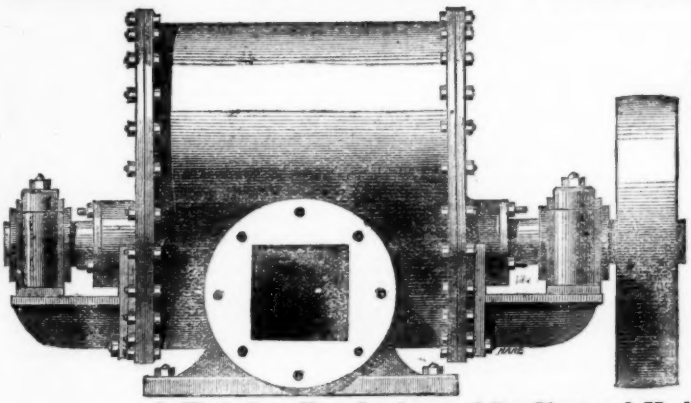
GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS,



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WROUGHT-IRON SPINDLES AND

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GEORGE WALLER & CO.,

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TAR, LIQUOR, AND OTHER PUMPS,
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G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

PHŒNIX ENGINEERING WORKS:

HOLLAND STREET, SOUTHWARK, S.E.

WANTED, Readers of the NEW Edition, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.

WANTED, further Masonic Votes for the Son of the late W. C. Watson, formerly of the Kingston-on-Thames Gas-Works. 323 votes were received in his favour for the October election, but 1000 more are necessary for his Election in April next.

Votes for *any charity* (as they can be exchanged) will be thankfully received by MAGNUS OHREN, SYDENHAM, S.E.

WANTED, by the Advertiser, a Young Man, aged 27, an Engagement in a Gas Company's Office, Assistant Engineer, or Clerk of Works, &c., has had every experience in a Gas-Works. First-class testimonials and references.

Address No. 695, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED,—The Advertiser, a Young Man, aged 39, married, is open for an Engagement as MANAGER and SECRETARY of a medium-sized Gas-Works, or SUB-MANAGER of a large Works. Has a thorough Knowledge of the Manufacture and Distribution of Gas in all its branches, having had sole management of Gas-Works for 16 years. Highest testimonials and references.

Address No. 678, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Man to take the Manage- ment of a small Gas-Works, where the whole of the duties will have to be performed by the person appointed. All applicants must have filled a similar situation, and their letters be accompanied with references and age. Wages 21s. per week, with house, coal, and gas.

Applications to be made personally or by letter to THOMAS HICKS, Secretary, Burnham Gas Company, Limited, Burnham, SOMERSET.

ADVERTISER, aged 21, is desirous of an Engagement on Gas-Works. Can Read and Fix Meters; has had good experience of the Lathe, and is willing to be generally useful.

Address R. C., care of Messrs. Willey and Co., Gas Engineers, EXETER.

A Gas-Fitter, aged 30, requires a Situa- tion, at a Gas-Works preferred, in a small town. Practically acquainted with the trade in all its branches. References to be had from last employer, both to character and quality of work.

Address E. WEBB, 2, Freeman Street, BIRMINGHAM.

A Young Gentleman, aged 25, who has served three years as Pupil and four years as Assistant Manager in a Provincial Gas-Works, making 80 millions, is desirous of a change. Has a thorough Knowledge of the Manufacture and Distribution of Gas in all its branches, and is willing to make himself generally useful. Moderate salary required. No objection to go abroad. First-class testimonials and references.

Address No. 696, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Rugby Gaslight and Coke Company, Limited, an Active, Steady Man, as FOREMAN for the Works. He will have to Lay Mains and Services, take Indexes of Meters, and attend to complaints. Wages 28s. per week, with house, coal, and gas.

P. SIMPSON.

CLERK OF WORKS REQUIRED.

REQUIRED, the Services of a person to act as CLERK of WORKS, and Take Charge of the Erection (under the direction of the Engineer) of Gas-Works in England. The applicants must be thoroughly conversant with all duties connected with the erection of such works, and fully qualified to measure quantities, &c.

Applications, with testimonials, stating age and salary required, to be sent to Mr. A. UPWARD, 8, Queen Anne's Gate, WESTMINSTER, not later than Oct. 30, 1880.

CITY OF LIVERPOOL.

LIGHTING INSPECTOR.

WANTED, in the Office of the Inspector of Gas-Meters, a Person to Superintend the Erection of all Public Lamps in the streets and courts within the city, and generally to assist in the Gas Inspector's Department. Salary £2 per week.

Applications, in candidate's own hand, endorsed "Application for Lighting Inspectorship," stating age, qualifications, and previous engagements, together with references, to be addressed to the City Engineer, Liverpool, not later than Nov. 1, 1880.

By order,
J. RAYNER, Town Clerk.

Municipal Office, Liverpool, Oct. 16, 1880.

MANCHESTER CORPORATION GAS-WORKS.

THE Gas Committee are prepared to re- ceive APPLICATIONS for the Appointment of an Experienced MANAGER at their Rochdale Road Station, at the salary of £300 per annum.

Applicants must have a thorough-practical knowledge of the Manufacture and Purification of Gas upon the most approved modern system, and be fully acquainted with the Construction and Working of the various Apparatus employed therein, and must have had experience in the control of large numbers of men.

The Manager will be required to devote the whole of his time to the duties of the position.

Applications, stating age and experience and enclosing testimonials, must be sent in not later than Twelve o'clock noon, on the 30th of October, addressed to the Chairman of the Gas Committee, Town Hall, Manchester, and endorsed "Application for Appointment as Station Manager." Canvassing will disqualify.

By order,
JOS. HERON, Town Clerk.

Town Hall, Manchester, Oct. 13, 1880.

WANTED, to Lease Gas-Works. Highest References.

Apply, by letter, to No. 686, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a good Second-hand Centre-VALVE, 4-in. Connections, to work two Purifiers forwards and backwards. Also a Second-hand SCRUBBER, 4-in. Connections, complete.
Address W. L. COPP, Watchet, SOMERSET.

WANTED, by the Pittenweem Gaslight Company, OFFERS for their GAS TAR for One year from Nov. 1, 1880.
The Company reserve the right to retain a small quantity for local requirements.
Offers to be lodged by the 23rd of October with THOMAS NICOLSON, the Secretary, from whom particulars may be had.
Pittenweem, Oct. 11, 1880.

SLEAFORD GAS COMPANY, LIMITED.

FOR SALE—Single Gasholder, 32 ft. by 14 ft., Counter-balanced, Connections and all complete, in good condition. Reason for removal, ground wanted.
Particulars to be had of HARRY WINHURST.

AMMONIACAL LIQUOR FOR SALE.

THE Directors of the Dronfield Gas-light and Coke Company invite TENDERS for the Purchase of the AMMONIACAL LIQUOR produced at their Works from Nov. 1, 1880, to Dec. 31, 1881.
Tenders, stating price per ton at the Works, or delivered in casks at Dronfield Railway Station, to be sent to me not later than the 31st inst.
The Directors do not bind themselves to accept the highest or any tender.
CHRISTOPHER THORPE, Secretary.
Chesterfield, Oct. 2, 1880.

FOR SALE.—In consequence of the decease of Mr. Milne, a GAS-WORKS in a small Manufacturing Town in Ulster. Present make 1½ millions, which might be increased.
For particulars apply to ALEXR. MILNE AND CO., Gas-Works Lessees and Engineers, 11, Chichester Street, BELFAST.

THE Gloucester Gas Company have the undermentioned APPARATUS for Sale :—
About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.
Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12-in. Connections.
Exhauster (Jones) to pass about 15,000 feet per hour.
Exhauster (Beales) to pass about 25,000 feet per hour.
Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.
Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.
4-horse power Horizontal Steam-Engine.
Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves and 12-in. Connections.
Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.
Gasholder, Double Lift, capacity 100,000 feet.
Gasholder, Double Lift, capacity 240,000 feet.
One 12-in. Governor, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.
Two 12-in. four-way faced Valves, by Cockey.
For further information, &c., apply to the undersigned.
R. MORLAND, Engineer.

BOROUGH OF READING.

THE Reading Urban Sanitary Authority are desirous of receiving TENDERS for a Supply of GAS TAR for a term of One year. The quantity required will be about 10,000 gallons, which is to be delivered at the Store Yard, Caversham Road, or at either of the Railway Stations, in quantities not less than 20 barrels at one time when required, and must be free from Ammoniacal Liquor.
Tenders to be delivered to me, sealed and endorsed "Tender for Gas Tar," not later than 5 p.m. on Wednesday, the 20th of October inst.
ALBERT W. PARRY, Borough Surveyor, &c.
Town Hall, Reading, Oct. 5, 1880.

BELPER GAS COMPANY.

TENDERS are required for the Sale of the Surplus TAR and the whole of the AMMONIACAL LIQUOR made at the Works of the above Company at Belper.
Tenders, stating price per ton for One, Two, or Three years, delivered into Contractor's own tanks at Belper Station, to be sent to me on or before Saturday, Nov. 6, 1880.
The Directors do not bind themselves to accept the lowest or any tender.
Monthly payments and security (if necessary) required.
JOSEPH PYM, Secretary.
Belper, Oct. 13, 1880.

TO CHEMICAL MANUFACTURERS, TAR DISTILLERS, AND OTHERS.

TENDER FOR TAR AND LIQUOR.

THE Directors of the Gravesend and Milton Gaslight Company are prepared to receive TENDERS for the Purchase of their Surplus TAR and AMMONIACAL LIQUOR for One or Two years from the 17th of November next.
The quantity of Tar will be about 65,000 gallons, and that of Liquor about 90,000 gallons in the year.
The Company will load into the Contractor's barges.
The average strength of the Liquor is about 12 ounces, but the Company will not guarantee that or any other strength.
Tenders for the Liquor must state the price at per butt of 108 gallons per ounce of strength.
Any further particulars can be obtained on application at the Works at Gravesend.
Tenders, marked "Tender for Tar, &c.," to be sent to my Office, 27, King Street, Gravesend, on or before Wednesday, Nov. 3, next.
The Directors do not bind themselves to accept the highest or any tender.
CHAS. R. GRAMSHAW, Secretary.
Gravesend.

BAHIA GAS COMPANY, LIMITED.
NOTICE is hereby given that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the Company's Office, Nos. 7 and 8, Idol Lane, London, on THURSDAY, the 4th day of November, 1880, to receive the Report of the Directors, the Balance-Sheet confirmed by the Auditors, and for general purposes.
The chair will be taken at Three o'clock precisely.
The Transfer Books will be closed from the 21st inst. until after the meeting.
By order of the Board,
ALFRED J. HEAD, Secretary.
Oct. 7, 1880.

RYDE, ISLE OF WIGHT.

TO CAPITALISTS, GAS SHAREHOLDERS AND INVESTORS GENERALLY.

IMPORTANT SALE OF GAS SHARES.

MESSRS. E. MARVIN and SONS will SELL by AUCTION, at Yelf's Hotel, Ryde, on Thursday, Oct. 21, 1880, at Six for Seven o'clock in the evening, 69 SHARES, in the Ryde Gaslight Company—viz., 23 Originals paying 9 per cent., and 46 of later issues paying 7 per cent., all of the nominal value of £12 10s. each.
Particulars and conditions of sale may be obtained of J. W. FARDELL, Esq., the Vendor's Solicitor, Cambrian House Offices, or of the AUCTIONEERS, at their Auction and Estate Agency Offices, No. 9, Union Street, Ryde, ISLE OF WIGHT.

TO ENGINEERS AND IRONFOUNDERS.

THE Corporation of Birkenhead invite TENDERS for the Construction of HOISTING APPARATUS in connection with Purifiers at their Works.
Specification and drawings may be seen at the Gas and Water Offices, 50, Hamilton Square, where form of tender, together with any other information, may be obtained from Mr. Paterson, the Gas-Works Engineer.
Sealed tenders, endorsed "Hoisting Apparatus," and addressed to the Chairman of the Gas and Water Committee, Birkenhead, must be sent in on or before the 22nd inst.
The Corporation do not bind themselves to accept the lowest or any tender, and no tender will be considered by the Committee unless sent in on the form provided for that purpose.
By order,
ALFRED GILL, Town Clerk.
Municipal Offices, Hamilton Square, Oct. 12, 1880.

TO TAR DISTILLERS.

THE Directors of the British Gaslight Company, Limited, invite TENDERS for the Purchase of the Surplus TAR—about 300,000 gallons yearly—produced at their Norwich Station for One, Two, or Three years, commencing on Feb. 10, 1881. The Tar to be delivered into the Contractor's tank barges alongside the Company's Works, and the quantity so delivered to be then agreed.
Any further particulars may be obtained on application to the Secretary, at the Chief Office of the Company, No. 11, George Yard, Lombard Street, where tenders are to be sent on or before Monday, Nov. 15, next.
The Directors do not bind themselves to accept the highest or any other tender.
FREDC. LANE LINGING, Secretary.
Chief Office, No. 11, George Yard, Lombard Street, London, E.C.

TO MANUFACTURING CHEMISTS.

THE Directors of the British Gaslight Company, Limited, invite TENDERS for the Purchase of AMMONIACAL LIQUOR—about 500,000 gallons yearly—produced at their Norwich Station, for a term of One, Two, or Three years, commencing on Feb. 10, 1881. The Liquor to be delivered into the Contractor's tank-barges alongside the Company's Works, and the strength of the Liquor to be tested by Twaddel's hydrometer, as delivered into such barges.
The tender to state the price per ounce of strength commencing at 8 ounces or 4 degrees of Twaddel, for each butt of 108 gallons, for every half ounce of strength, as, for instance, from 8 oz. to 8½ oz., 8½ oz. to 9 oz., and so on, and ranging up to 18 ounces or 9 degrees of Twaddel.
Further particulars may be obtained on application to the Secretary, at the Chief Office of the Company, No. 11, George Yard, Lombard Street, where tenders are to be sent on or before Monday, Nov. 15, next.
The Directors do not bind themselves to accept the highest or any other tender.
FREDC. LANE LINGING, Secretary.
Chief Office, No. 11, George Yard, Lombard Street, London, E.C.

GARSIDE'S IMPROVED MAIN DRILLING CLIP.
No. 1 takes from 2-in. to 6-in. Mains.
No. 2 takes from 6-in. to 12-in. Mains.
GARSIDE'S REGISTERED TUBE-VICE takes ⅝ brass to a 2-in. Socket.
May be had direct from the maker, SAMUEL GARSIDE, Gatefield Iron-Works, ASHTON-UNDER-LYNE.

Prices, half bound, cloth sides, 2 quires, 30s.; 3 quires, 36s.; other sizes and bindings to order.

THE
GAS COMPANIES EXPENDITURE JOURNAL,
Being a Ruled Account-Book with Printed Headings, and Analyzing Guide for Keeping, upon the easiest and most correct method, the Expenditure of a Gas Company, in accordance with the provisions of the Gas-Works Clauses Act of 1871, and suitable for all Companies.

Specimen, with illustration and full particulars; 2s. 6d. returned on the purchase of a "Journal."

Published by SANDELL AND SON, Accountants, 2, Great George Street, WESTMINSTER, and W. KING, Office of the JOURNAL OF GAS LIGHTING, 11, Bolt Court, FLEET STREET, E.C.

MR. CORBET WOODALL, C.E.,
Has Removed his Office to
PALACE CHAMBERS, BRIDGE STREET,
WESTMINSTER, S.W.

NOTICE OF REMOVAL.

THE OWNERS OF
THE
BIRTLEY IRON-WORKS
AND
PELAW MAIN COLLIERIES
Have REMOVED their London OFFICES from No. 101, Cannon Street, to No. 46, Cannon Street.
Their Warehouse for Gas and Water Pipes and other Castings is at Scott's Wharf, Bankside, SOUTHWARK.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.
Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.
Patents procured for Foreign Countries.
Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

SOUTHPORT CORPORATION GAS-WORKS.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee are prepared to receive TENDERS for the Surplus TAR produced at the Gas-Works for a period of One or Two years from the 18th of November next
Further particulars may be obtained on application to Mr. Booth, Gas Manager.
Tenders, endorsed "Tar," to be sent in to me not later than Wednesday, Oct. 27 next.
By order,
J. H. ELLIS, Town Clerk.
Town Hall, Southport, Sept. 25, 1880.

COLCHESTER GAS COMPANY.

THE Directors of the Colchester Gas Company are prepared to receive TENDERS from competent persons for the following WORKS:—
Contract No 4.—The Delivery and Erection of a Telescopic Gasholder 90 ft. in diameter and Appendages.
The drawings and specification may be seen and forms of tender with quantities obtained, on payment of one guinea (which will be returned if a *bonâ fide* tender be made) at the Offices of the Gas Company, Queen Street, Colchester, or of Mr. G. W. Stevenson, Engineer, 38, Parliament Street, Westminster; and sealed tenders, properly endorsed, must be delivered, addressed to J. B. Harvey, Esq., J.P., Chairman of Directors, at the Offices of the Company, on or before Friday, Oct. 29, 1880.
The Directors do not bind themselves to accept the lowest or any tender.
By order,
J. T. BROWNING, Manager and Secretary.

TO CONTRACTORS AND BUILDERS.

TENDERS are required for the Erec-tion of a RETORT-HOUSE and COAL STORES, RETORT BENCH and CHIMNEY for the Sutton, Southcoates, and Drypool Gas Company, Hull.
Drawings and specification may be seen at the Office of the Company, at the GAS-WORKS, Hull, and at the Office of the Engineer, Mr. Thomas Newbigging, C.E., 5, Norfolk Street, Manchester. Copies of the specification, bill of quantities, and form of tender may be obtained of the Engineer on payment of two guineas, which will be returned on receipt of a *bona fide* tender.
Sealed tenders, endorsed "Retort-House, &c., Contract No. 1," to be delivered to the undersigned not later than Twelve o'clock noon, on Thursday, Oct. 28, 1880.
The lowest or any tender will not necessarily be accepted.
By order of the Directors.
F. W. OLDFIELD, Manager.
Sutton, Southcoates, and Drypool Gas Company, Hull.

BLACKBURN CORPORATION GAS DEPARTMENT.

EXHIBITION OF GAS OVENS, STOVES, ENGINES, BURNERS, AND OTHER APPLIANCES AND INVENTIONS FOR THE ECONOMIC USE OF GAS FOR DOMESTIC AND MANUFACTURING PURPOSES.

THE Gas Committee of the Blackburn Corporation have determined to hold an Exhibition as above stated in the
ASSEMBLY ROOMS, TOWN HALL, BLACKBURN,
To commence on the 10th of November, and continue for Twelve Days.
As the Committee wish to make the Exhibition a success, they desire that persons intending to exhibit will apply for space on or before the 25th of October.
Forms of application for space and any information required may be had from the undersigned.
S. R. OGDEN, Engineer and Manager.

GAS APPARATUS EXHIBITION IN GLASGOW.

PHILP'S COCKBURN HOTEL,
141, BATH STREET, GLASGOW.

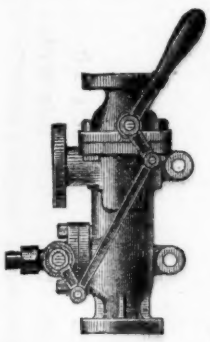
This Large New Hotel is in connection with the well-known Cockburn Hotel, Edinburgh, and conducted on the same principles.

CHARGES MODERATE.

Special Terms for Parties staying a week or longer.

J. PHILP, PROPRIETOR.

THE
THAMES BANK IRON COMPANY,
UPPER GROUND STREET, LONDON, S.E.,
SUPPLY FROM STOCK
CAST-IRON RETORTS AND ALL KINDS OF GAS-WORKS APPARATUS,
SOCKET-PIPES FOR GAS OR WATER PURPOSES,
FLANGE-PIPES FOR STEAM,
RAIN-WATER PIPES AND GUTTERS,
HOT-WATER BOILERS, PIPES, AND CONNECTIONS,
LAMP-COLUMNS, LAMPS, LAMP-FRAMES, WROUGHT TUBES, &c.,
HOT WATER AND HOT AIR APPARATUS,
Erected complete on the most Improved Principles.



KÖRTING'S
UNIVERSAL INJECTOR,
ENTIRELY SELF-REGULATING.
LIFTS 26 FEET.
FEEDS WITH HOT OR COLD WATER.
WORKS WITH HIGH OR LOW STEAM PRESSURE.

Price Lists on application to

KÖRTING BROTHERS,
17, LANCASTER AVENUE, MANCHESTER.

E. & W. H. HALEY,
IRONFOUNDERS & MAKERS OF
CAST-IRON PIPES
FOR
GAS, WATER, & STEAM.

LISTER HILLS FOUNDRY,
BRADFORD, YORKSHIRE.

W. C. HOLMES & Co.,
ENGINEERS AND CONTRACTORS
FOR
GAS AND WATER-WORKS,
WHITESTONE IRON-WORKS,
HUDDERSFIELD.

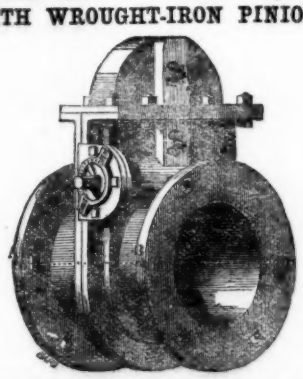
REFERENCES TO UPWARDS OF 400 WORKS.

Price 28s. each, handsomely bound in Morocco, cloth sides, gilt edged and lettered.

THE FIRST AND SECOND VOLUMES
OF
KING'S TREATISE
On the Science and Practice of the Manufacture and Distribution of
COAL GAS.
Edited by THOS. NEWBIGGING, C.E., M.Inst.C.E. and W. T. FEWTRELL, F.C.S.

Orders received by
WALTER KING, 11, Bolt Court, Fleet Street, London, E.C.

B. DONKIN & Co.'S
IMPROVED GAS-VALVES
WITH WROUGHT-IRON PINIONS.



These Valves are proved on both sides to 30 lbs. on the square inch before leaving the works, and are kept in stock.
In ordering Valves, please state whether required for under or above ground, and if to be with flanges or spigots and sockets cast on, or with separate spigot and socket pieces.

ALSO MAKERS OF
J. BEALE'S NEW PATENT GAS EXHAUSTERS, STEAM-ENGINES for Driving Gas Exhausters,
VALVES FOR AMMONIACAL LIQUOR, TAR, &c., IMPROVED BRIDGE VALVES for Regulating the Seal in Hydraulic Mains, so arranged that when once adjusted for the proper overflow they can be closed entirely and opened again without altering the adjustment.
GAS THROTTLE-VALVES, SPECIAL GAS-VALVES with Columns, Gauges, &c.
BYE-PASS VALVES, SCREW WATER-VALVES, &c., &c.

B. DONKIN & Co., BERMONDSEY, LONDON, S.E.

ECONOMY IN THE PRODUCTION OF GAS.
PLUTONIC CEMENT,
FOR JOINTING AND REPAIRING RETORTS AND OVENS *in* ACTION AND *out* OF ACTION.

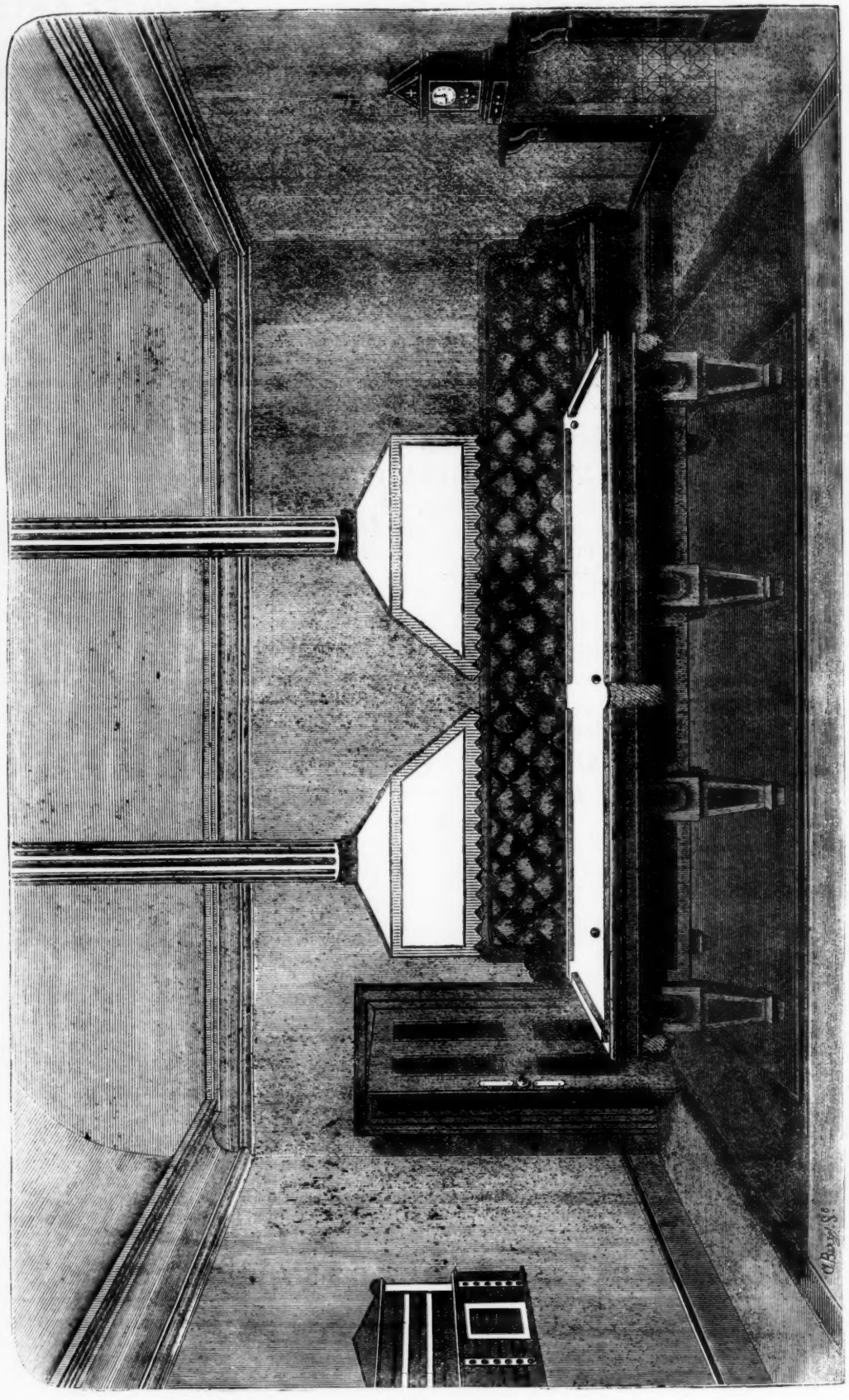
Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,

WILLIAM RICHARDSON, Gas and Hydraulic Engineer, CHARLES HENRY STREET, and BISSELL STREET, BIRMINGHAM.

THE LATEST NOVELTY

FOR THE EFFECTIVE LIGHTING of BILLIARD TABLES.

BILLIARD TABLE LIGHTING BY WILLIAM SUGG'S PATENT SELF-VENTILATING SYSTEM AND BURNERS OF HIGH ILLUMINATING POWER.



Securing a Total Absence of Heat and Shadow, with a Steady and Brilliantly White Light, and Small Consumption of Gas.

N.B.—All products of combustion are carried away into the open air, and cannot, therefore, mix with and vitiate the atmosphere of the room.

One of the above has been fitted up in the Billiard-Room of the Raleigh Club, Regent Street, and the Secretary states that the Table is the best lighted he has ever seen.

APPLY TO

WILLIAM SUGG,

VINCENT WORKS, WESTMINSTER, & GRAND HOTEL BUILDINGS, CHARING CROSS.

SAMUEL CUTLER & SONS,

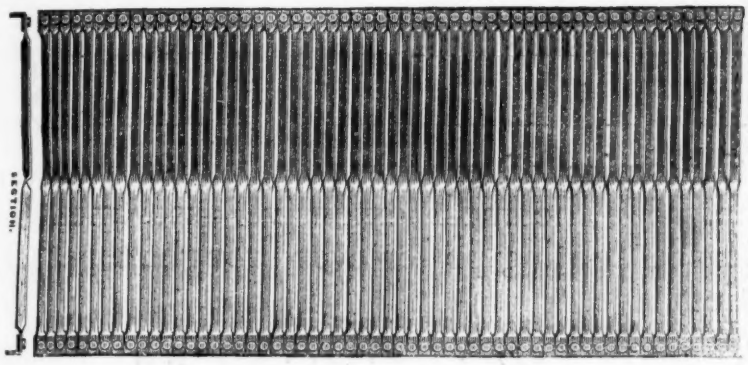
MILLWALL, LONDON, E.,

CONTRACTORS FOR THE

ERECTION OF GAS AND WATER WORKS,

Undertake their ENTIRE ERECTION or EXTENSION in any part of the World, including Small Works for VILLAGES and MANSIONS, as well as of very LARGE EXTENT. Have recently constructed for the PHŒNIX GAS COMPANY the LARGEST GASHOLDER yet erected.

S. C. and SONS supply *every* requisite for Gas-Works, and keep in stock Small Articles, such as BARROWS, SCOOPS, RETORT-LIDS, BOLTS, &c.; and they manufacture WOOD SIEVES of a very superior description.



CUTLER'S PATENT WATER-VALVES

Are the very best possible as PURIFIER VALVES; leakage impossible, most easy to work, never get out of order or the worse for wear, and can, if desired, be very simply arranged to work the whole or a part of a set of Purifiers in any conceivable order whatever. Have already been erected and approved at the London Gas-Works, Nine Elms; Phœnix Gas-Works, Greenwich; Maidstone, Ipswich, &c.

Full Particulars on Application.

CUTLER'S PATENT SIEVES

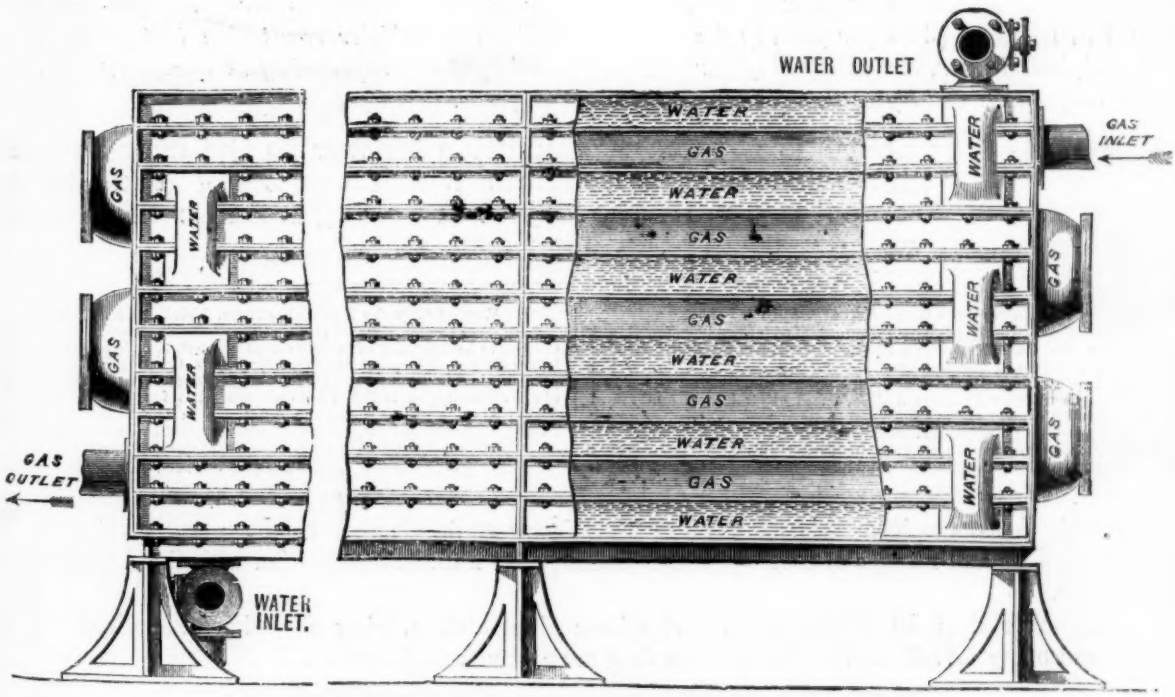
Are the most durable. The sieve bars presenting an inclined plane to the flow of the Gas, offer the least possible resistance, greatly reducing pressure, and permitting contact with every part of the purifying material. Have been supplied to many of the London and Provincial Gas-Works, and give great satisfaction.

Copies of Testimonials on Application.

MORRIS AND CUTLER'S PATENT CONDENSERS

Adopt water as a cooling medium, the respective streams flowing in opposite directions; quantity of water required but small, and being only raised in temperature, is useful for any purpose of the works. The power of Condensers can be regulated at will by the amount of water permitted to pass through. Erected and giving great satisfaction at Brentford, Tunbridge Wells, Maidstone, Buxton, Phœnix Gas-Works, Greenwich; where its advantages may be seen.

Mr. WATES, of Greenwich, has kindly offered to reply to any inquiries addressed to him as to its efficiency.



Also CUTLER'S PATENT MOUTHPIECE SUPPORTS,

AND

CUTLER'S PATENT REMOVABLE DIPS.

[*See* JOURNAL for Nov. 25, 1879.]

The understated declaration with which we introduced our apparatus when the Argand system was in the full tide of its fame, has been fully borne out by general experience, namely—

"THE FLAT-FLAME IS THE ONLY PRACTICABLE SYSTEM FOR STREET LIGHTING; and, 'in actual use,' yields as much light with Common Gas, and more with Cannel Gas, than any Argand System."

CHARLES HUNT, Esq. (President of the British Association of Gas Managers), in his Inaugural Address to the members at their annual meeting, held in London, June, 1880, said: "Rivalry has stimulated into being, for outdoor purposes mainly, Burners of large power, that have fully maintained the superiority of coal gas over the electric light. To Mr. Bray our thanks are due for his development of the **FLAT-FLAME BURNER** into a lighting medium of a very high order, *and for his vindication of its claims to practical consideration.*"

The above declaration was received with marked applause by the crowded meeting.

BIRMINGHAM LAMP TESTS.

AFTER the most exhaustive series of experiments, extending over more than twelve months, with the most extensive assortment of Burners and Lanterns of large lighting power ever brought together, the Birmingham Authorities have

ADOPTED BRAY'S SYSTEM

for their Street-Lighting Improvements, for which purpose Sixty-Five 100-candles power Lanterns of medium lighting power are being fixed.

The apparatus used in the above tests were all of our usual medium lighting power class, and the tests showed that we sacrifice a considerable amount of lighting power for general efficiency. The tests further showed that our 80-*candles* HIGHEST *lighting power burner yielded* 3·51 *candles per foot of gas—the quality being* 16·75 *candles* (3·35 *per foot*) *by the standard—which was a higher result than that yielded by any other flat-flame burner, though copies of our Slit-Unions, enlarged and improved by us Jan.*, 1879, *were used by our competitor; and higher than the* 80-*candles power Argands.*

NOTE.—The above is the most conclusive answer to the ever-changing and misleading statements which are being made by our competitor, with the object of taking from us the honours we have secured in open contest.

Extract from the *Leeds Mercury*, April 1, 1880.

At the meeting of the Leeds Town Council, March 31, Alderman Gaunt moved that the Council approve of the acceptance by the Corporate Property Committee of the tender of Messrs. Geo. Bray and Co. for the supply of 21 new lamps, to be placed upon the pillars round the Town Hall. The Committee had tested Sugg's and other lamps, and found Messrs. Bray's the best. It was intended to have two 200-candles power and two 100-candles power, and 17 round the hall of 80-candles power. Mr. Lynd, in seconding the motion, said that he had had an opportunity of seeing different lamps tested at Birmingham, and he was in favour of Messrs. Bray's.

Extract from the *Daily Free Press*, Aberdeen, Jan. 1, 1880.

Judging of the merits of the lights as they appeared last night, on-lookers seemed to be generally of opinion that between Sugg's patent and Bray's larger light at the corner of Union Buildings, Castle Street, there was no perceptible difference in the illuminating power. When the vital question of gas consumption is taken into account, it is found that in the Castle Street lamps there is a marked difference in the quantity of gas consumed, for while 30 feet of gas are hourly burned in Sugg's Patent Lamp, only 20 feet are used by Bray's Lamp during the same period.

[The above Lamps have Meters attached.]

BRAY'S LANTERNS have been adopted by the Vestry of St. George, Hanover Square, London, for all the crossings and refuges of that important district, after a direct competition with the Argand system of lighting.

Also more than 50 Towns and Vestries have adopted them, after a similar competition in most cases; and many private users. In all cases they are a pronounced success.

GEORGE BRAY & CO., BLACKMAN LANE, LEEDS.

June, 1880.

SIMPLE v. COMPLEX METERS.

The WARNER & COWAN Meter is not one of the class called "Compensating." So far as the parts external to the drum are concerned, it is an "Ordinary" Meter of the simplest kind. Nor is the drum itself in any way complicated, for the simplicity of its principle is equalled by that of its construction.

Unaffected by variations of the water-level, the measurement is always practically correct; and this being so, compensating arrangements are unnecessary. The evils to which such complex additions to Meters give rise, are well known. Of doubtful efficacy and uncertain action, these water-line maintainers are open to the further serious objection that they injuriously complicate the Meter, and so increase the necessity and frequency, as well as the difficulty and cost, of repairs.

It is in the defects of the common drum that compensating contrivances find their only justification. In connection with an unvarying drum they would be superfluous.

The WARNER & COWAN drum needs no such uncertain aid, nor is frequent periodical watering necessary. Any town or district, supplied exclusively with these Meters, would not require more than an annual visit for the purpose of "systematic watering."

W. & B. COWAN,

(ESTABLISHED 1827.)

CHURCH ST., MILLBANK ST., *LONDON, S.W.* | DUTTON ST., NEW BRIDGE ST., *MANCHESTER.* | BUCCLEUCH ST. WORKS, *EDINBURGH.*

THE

MANN & WALKERS' PATENT SCRUBBER.

Extensive use. The successful and extensive use of the Mann and Walkers' Patent Scrubbers in all parts of the world has demonstrated their advantages, and entitled them to be received with credit and confidence. The number of them in use is about twenty times that of any other known means of purifying gas from ammonia.

Small quantity of Water required. By a very small quantity of clean water (not more than 5 or 6 gallons per ton of coals carbonized) the whole of the Ammonia contained in the Gas is completely absorbed; the Gas, after only once passing through, issuing from the Scrubber outlet completely purified from Ammonia. The Scrubber gives no appreciable back pressure.

Residual Product obtained. The Residual Product—namely, the Ammoniacal Liquor—is obtained at from 20 to 30 ounces commercial strength, which enables it, after being mixed with the weaker Liquor from the hydraulic main and condensers, to be sold to the Manufacturing Chemists, or converted into Sulphate, at the degree of strength found most profitable to the Gas Company.

Illuminating power increased. The Scrubber is a Saturator, and the Gas being soaked in this strong solution of Ammonia in the lower columns of the Scrubber, is purified from a large amount of Carbonic Acid, and its Illuminating Power is thereby increased.

Small amount of power required. The friction is so little, and the motion so slow, that the power necessary to work the Scrubber is almost inappreciable. A small gas-engine will work a pair of Scrubbers, purifying 2 million cubic feet of gas per day.

Beckton Gas-Works. There are thirty of these Patent Scrubbers in the Beckton Gas-Works, equal to purifying 30 million cubic feet per day, and the total amount of engine power necessary to work the whole 30 is not equal to that given out by one 10-horse engine.

Reserve purifying power contained. There is also a most important advantage arising from the height of these Scrubbers, in the reserve force contained in them. In the event of any stoppage, the mass of soaked and wetted material would continue the purification for hours, even if the supply of water and working were stopped from any cause.

Internal Materials not changed. The changing of the soaking materials in these Scrubbers is very seldom required; they are well known to remain in action for seven years without being emptied.

Guarantee They are in all cases erected under guarantees; they easily fulfil the stipulations of any Act of Parliament, and the chemical restrictions of the Board of Trade; and in cost they are much less to a Gas Company than any other known means of purifying Gas from Ammonia.

C. & W. WALKER.

8, *Finsbury Circus, London, E.C.*

F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

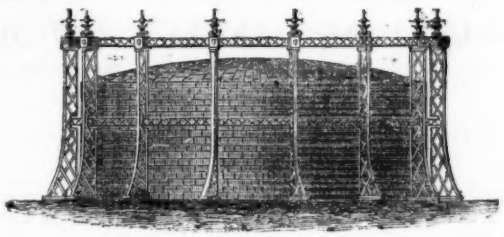
ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

6, WESTMINSTER CHAMBERS, VICTORIA STREET,

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

S. OWENS & CO.,

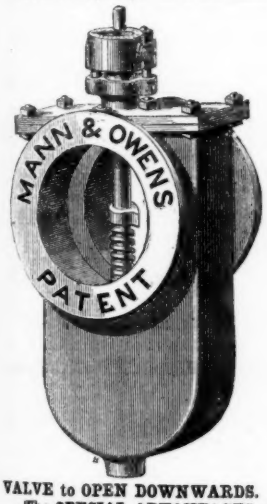
HYDRAULIC, GAS, AND GENERAL ENGINEERS,

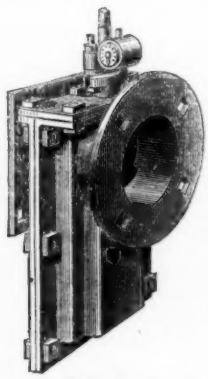
WHITEFRIARS STREET, LONDON, E.C.

SOLE MANUFACTURERS OF

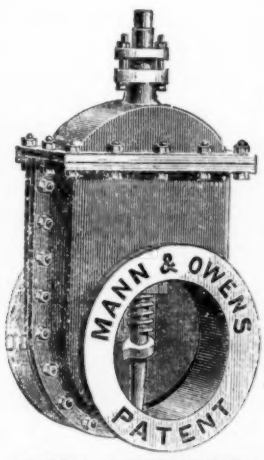
MANN & OWENS PATENT SCREW AND CAM, ALSO IMPROVED FULL-WAY RACK AND PINION GAS-VALVES.

Protected by Royal Letters Patent in England, France, Belgium, & the United States of America.





BRIDGE-VALVE
for Regulating the Seal of Hydraulic Mains.



VALVE to OPEN DOWNWARDS. VALVE to OPEN UPWARDS.

The SPECIAL ADVANTAGES of MANN AND OWENS' PATENT VALVE are as follows:—

1. Its non-liability to become set fast through varying temperature or from the deposit from crude gas. 2. It is made absolutely gas-tight by the simple action of a screw and cam. 3. Inconvenience through the breakage of springs or wedges setting fast cannot arise. 4. The face of the Valve is scraped and cleaned of any solid matter at each operation of opening or closing.

The Valve can be had to work either in a Vertical or Horizontal position.

Every Valve is carefully tested under pressure, and warranted perfectly sound and gas-tight.

INSTRUCTIONS FOR ORDERING.

State whether required for above or below ground, if Double Flange or Socket and Spigot Valves are wanted, or with loose Flanged Socket and Spigot pieces.

The Prices include Indicators to show extent to which Valve is open.

Also makers of PILLAR-VALVES, SELF-ACTING BYE-PASS VALVES, OUTSIDE RACK AND PINION VALVES, HYDRAULIC-MAIN VALVES, DISC-VALVES, &c.

Every description of Pumping Apparatus, Hydraulic Lifts, &c., suitable for use in Gas-Works, made to order.

PRICES, SIZES, AND FULL PARTICULARS, WITH COMPLETE ILLUSTRATED CATALOGUE, FURNISHED ON APPLICATION.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

HENRY LYON,

MECHANICAL AND CONSULTING GAS ENGINEER,

NORWOOD, NORTHENDEN ROAD,

SALE, NEAR MANCHESTER.

ALFRED LASS,

Fellow of the Institute of Chartered Accountants,

SPECIAL ACCOUNTANT FOR GAS AND WATER UNDERTAKINGS,

30, GRACECHURCH STREET, LONDON.

Accounts Analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed by Mr. Lass to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, Corporations, and Local Boards.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

THOMAS PROUD,

BROOKFIELD WORKS,

103, ICKNIELD ST., BIRMINGHAM,

MANUFACTURER OF

WOOD GRIDS

FOR

PURIFIERS AND SCRUBBERS,

AND

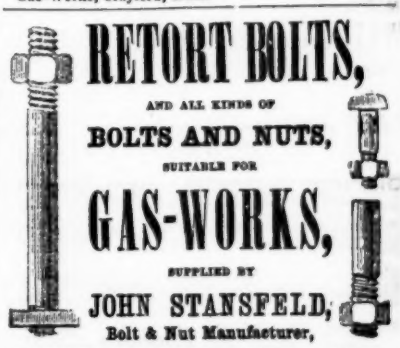
GENERAL STEEL AND IRON TOOLS AND MATERIAL USED IN GAS-WORKS.

BOX'S PATENT STREET GAS-LAMP

Has the following good qualities:—

1. No putty or other material is required for glazing. Thus there is no hacking out of old putty on removal of the glass, with the *consequent damage* to the lamp frames. 2. No liability to breakage by unequal expansion of the glass caused by changes of temperature. 3. Any inexperienced workman can glaze the lamp in a few minutes. 4. The system of glazing can be applied to any existing lamp at a trifling cost. 5. It is cheap, strong, and durable. 6. The glass can be easily removed so that the frames can be thoroughly painted inside and out.

The lamp may be supplied fitted with clear opal or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing lamps to this system can be supplied at moderate prices and a small charge for royalty. Licences granted on the most reasonable terms. For further particulars apply to the Patentee, W. W. BOX,
Gas-Works, Crayford, Kent.



RETORT BOLTS,

AND ALL KINDS OF

BOLTS AND NUTS,

SUITABLE FOR

GAS-WORKS,

SUPPLIED BY

JOHN STANSFELD,

Bolt & Nut Manufacturer,

ALFRED ST., BOAR LANE, LEEDS.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, St. VINCENT STREET, GLASGOW.

TREES BOGHEAD.

SHOTTS BOGHEAD,

And all the first-class Scotch Cannels.

Prices and Analyses on application.

HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

For references and prices, either f. o. b. or by rail, apply to

W. RICHARDSON,
29, QUAYSIDE, NEWCASTLE-ON-TYNE.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields in *practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, Lumrran, West Riding and Silkstone Collieries, near LEEDS.

GAS COAL.

THE MIRFIELD COAL COMPANY are supplying GAS COAL of the best quality on trucks at their siding. This Coal contains 10 per cent. of Cannel, and, as analyzed by Mr. James Paterson, of Warrington, yields 12,600 *cubic feet of 16·67-candle gas, with 1430 lbs. of good Coke, per ton.* Ash in Coke, 1·88.

Apply to the MIRFIELD COLLIERY, Mirfield, NORMANTON.
London Agent: Mr. F. J. LEE SMITH, Bromley, KENT.

WOOD TROUGHING

For Preserving Service-Pipes.

Price from Three-Farthings per Foot,
In any Lengths.

THOS. PROUD,
Brookfield Works, Icknield St., Birmingham.

LIVESEY FIRE-CLAY WORKS,

NEAR BLACKBURN, LANCASHIRE.
(ESTABLISHED 1835.)

ORLANDO BROTHERS,

LIMITED,
MANUFACTURERS OF
PATENT CLAY RETORTS,
AND EVERY DESCRIPTION OF
TUBULAR GLAZED SEWERAGE PIPES,
BENDS, JUNCTIONS, &c.
Fire-Bricks, Tiles, Blocks, and Chimney-Tops.

IMPORTANT to GAS COMPANIES.

MESSRS. JOHN ABBOT & CO., LIMITED,

OF SUFFOLK LANE, LONDON, AND GATESHEAD,
Manufacture and Erect
SULPHATE PLANT
On the most Modern and Improved Plan.
EXAMPLES
Can now be seen at
NEWCASTLE, CARLISLE,
And will shortly be erected at the New Gas-Works,
TUNBRIDGE WELLS.

WILLIAM MACLEOD & CO.,

30, ST. ENOCH SQUARE, GLASGOW.

CAST-IRON GAS AND WATER PIPES.

Sole Agents in Scotland for the Torbay Paint Co.

Prices on application.

FERRAND DAVIES,

148, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.,
AGENT FOR
THOMAS BARR'S LESMAHAGOW MAIN CANNEL,
AND
NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS.
Analyses and Quotations on application.

WILSON CARTER AND PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

Address—CHIEF OFFICES:
TEMPLE BUILDINGS, 50, NEW STREET, BIRMINGHAM.

CANNEL AND GAS COALS.

THE DUKINFIELD COAL AND CANNEL COMPANY are prepared to deliver, to any Station, their Celebrated GAS COALS, which have a very high reputation for quantity of Gas and Illuminating Power, and make a First-class Coke.

Analyses and terms of delivery may be obtained by communicating with the above Company, at their Offices,

DUKINFIELD, NEAR MANCHESTER.

LONDONDERRY GAS COALS

DIRECT FROM THE
MARQUESS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.

For Prices and Particulars, apply to
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LONDONDERRY OFFICES, SEAHAM HARBOUR, COUNTY OF DURHAM.
London Agents: Messrs. LAMBERT BROS., 85, GRACECHURCH ST., E.C.

JOHN HALL AND CO., STOURBRIDGE,

Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

J. & H. ROBUS,

BUILDERS AND CONTRACTORS
FOR THE ERECTION AND REBUILDING OF GAS AND WATER WORKS,
RETORT-SETTING—A SPÉCIALITÉ.
ROBUS'S IMPROVED RETORT-SETTINGS, guaranteed to Carbonize a large amount of Coal with a small per cent. of Fuel.
ESTIMATES GIVEN FOR MAIN-LAYING.
N.B.—All kinds of Fire Goods and Gas Apparatus supplied on the shortest notice.
Address:—J. & H. ROBUS, BELL GREEN, CATFORD, LONDON, S.E.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,
35A, GREAT GEORGE STREET,
WESTMINSTER, S.W.,
PATENTEE and MANUFACTURER of the following Inventions:—
RETORT SETTINGS—giving great Economy of Fuel.
STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.
FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Twenty-Eight Illustrations and Letterpress, on the Construction of Gas-Works, will be sent, post free, on receipt of 4s. in stamps To be had of the AUTHOR; or at the Office of the "JOURNAL OF GAS LIGHTING."

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,
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ALDWARKE MAIN AND CAR HOUSE COLLIERIES,

Near ROTHERHAM.

JOHN BROWN & CO., LIMITED,

ATLAS STEEL AND IRON WORKS, SHEFFIELD.

PROPRIETORS.

The Aldwarke Main Brights is a first-class gas-making and coking Coal, yielding by analysis 12,600 feet of 19-candle gas per ton, and giving "Weight of illuminating matter in lbs. of sperm, 820·80." It is very free from impurities and foreign matter.

Copies of Analyses made by Gas Companies who have used it will be forwarded and Samples sent on application.

GAS COAL. GAS COAL. GAS COAL.

WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

THE WIGAN COAL & IRON COMPANY,

LIMITED.

MIDLAND DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: A. C. SCRIVENER,

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

LIVESEY'S PATENT WASHER.

This apparatus effects the most intimate contact between the liquor with which it is supplied and the gas passing through it, resulting in the complete removal of all particles of tar, increasing the ammonia strength of the scrubber and condenser liquor, and removing a large proportion of other impurities—notably, carbonic acid. The Washer is intended to work in conjunction with a scrubber. It occupies little space, and is inexpensive. It does not become clogged with tar or corroded by the action of the liquor or gases, it gives three inches of pressure, and only needs a supply of liquor to keep it in regular action without any further attention. It has been in constant successful use for five years, and is now in operation in upwards of fifty places.

Prices, fitted and fixed complete, exclusive of Valves and Connections; all foundations and unskilled labour required in erection to be provided by the Gas Company:—

Quantities to pass in cubic feet per 24 hours	100,000	250,000	500,000	750,000	1 million	1½ million	2 million	3 million	4 million
Price each	£30	£50	£70	£95	£120	£165	£200	£280	£360

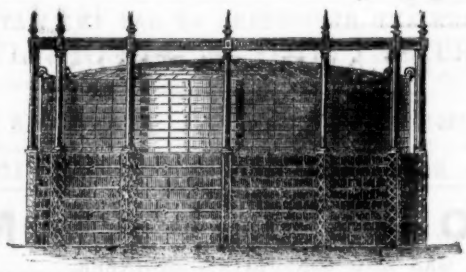
For further Particulars apply to

Messrs. DEMPSTER AND SONS, ELLAND, HALIFAX, for the North;

Messrs. BAILEY, PEGG, AND CO., Bankside, LONDON, S.E., for the South;

Messrs. WILLEY AND CO., Commercial Road, EXETER, for West of England and South Wales;

Or to the PATENTEE, 589, OLD KENT ROAD, LONDON, S.E.



HENRY BALFOUR & CO.,

ENGINEERS, IRONFOUNDERS, AND GAS APPARATUS MAKERS,

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Works: DURIE FOUNDRY, LEVEN, FIFE, N.B.

MANUFACTURERS OF

GASHOLDERS, SINGLE OR TELESCOPE, WITH OR WITHOUT COUNTERBALANCE GEAR; TANKS, CAST & WROUGHT IRON.

BOILERS, CONDENSERS, CRANES, EXHAUSTERS AND ENGINES,

GIRDERS (Cast and Wrought Iron), IRON PIPES, PUMPS, PURIFIERS, RETORTS & FITTINGS, ROOFS, SCRUBBERS, SHAFTING, VALVES, WASHERS.

ANDERSON'S PATENTED INVENTIONS, VIZ.—

FOUR-WAY BYE-PASS VALVES, ENGINES AND EXHAUSTERS, REVOLVING BRUSH SCRUBBERS, GAS-WASHERS, FUEL-MAKING MACHINES, GOVERNORS, &c.

H. B. & Co. undertake Contracts for the Supply and Erection of Gas-Works, either for Towns or Mansions, or the Remodelling of existing Works.

SHIPPING ORDERS receive special attention.

H. B. & Co. having had large experience in this Department, undertake to ship, f.o.b., properly packed and marked for export.

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SILICA FIRE-BRICK CO.,

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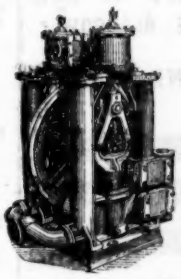
Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.

John Cameron's Specialities



ARE HIS

PATENT LEVER

PUNCHING MACHINES

AND HIS

STEAM-PUMPS

FOR

GAS-WORKS,

Feeding Boilers, Steam Fire-Engines, Colliery Deep Lifts, Irrigation, Contractors, and Chemical purposes.

WORKS:

OLDFIELD ROAD, SALFORD, MANCHESTER.

CROLL'S
DRY GAS-METERS,

PRIZE MEDALS. LONDON, 1851; NEW YORK, 1853; PARIS, 1855.

(INVENTED & PATENTED IN 1844,)

COMBINING ALL THE LATEST IMPROVEMENTS,

MANUFACTURED ONLY BY

PRIZE MEDALS. LONDON, 1862; DUBLIN, 186[illegible]; PARIS, 1867.

THE GAS-METER COMPANY, LIMITED,

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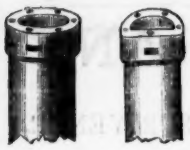
SOLE AGENT FOR SCOTLAND: JAMES KEITH, EDINBURGH AND ARBROATH.

OF IMMEDIATE IMPORTANCE TO ALL GAS FACTORIES.

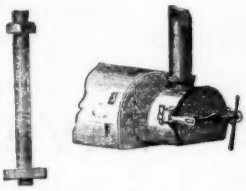


HARRIS & PEARSON, of Stourbridge, have an immense stock of **FIRE-CLAY GAS RETORTS,** all perfect and in good condition, and can supply orders of any magnitude, to any size or pattern, immediately on receipt of specification. Any Gas-Works disappointed by delay in the execution of Retort orders will do well to take advantage of this. Inspection invited.

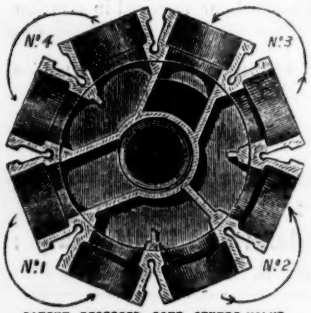
HARRIS & PEARSON manufacture best Retort Bolts, Cast Iron Retort Mouthpieces, Fittings, and Lids, Cast Iron Gas and Water Pipes, and Connections of all Shapes and Sizes.

Glazed Bricks, white and in colours, Porcelain Baths, Fire-Clay Goods of all kinds, Hard Blue Paving Bricks for Retort Houses.

Prices, Drawings, and Specifications if desired.



Please note carefully the Address:—"HARRIS & PEARSON, STOURBRIDGE," as there are other Firms similar in name.



PATENT RECESSED CONE CENTRE-VALVE. *Sectional Plan.*

R. LAIDLAW AND SON,

EDINBURGH AND GLASGOW.

SOLE MAKERS OF

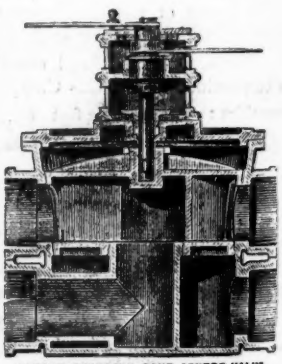
PATENT

RECESSED CONE CENTRE-VALVES,

Constructed on the principle of the ordinary Plug-Cock.

THROUGH-WAY & FOUR-WAY COCKS

Of all descriptions.



PATENT RECESSED CONE CENTRE-VALVE. *Sectional Elevation.*

London Office: 6, LITTLE BUSH LANE, CANNON STREET.

D. HULETT & CO.

Invite the attention of Gas Companies, Corporations, and others to their

PATENT STREET LAMPS,

Which are so constructed that neither putty nor other materials are required to secure the glass. No hacking out of old putty, which frequently destroys the frames. A new pane of glass can be inserted in two or three minutes by any inexperienced person, the glass being secured by a hinged flap and turn button.

PRICE, with Opaline Reflecting Top, 12s.; with Fluted Glass Top, 10s. 6d.
Also made **EXTRA STOUT** recommended for its durability.

D. HULETT'S IMPROVED SERVICE CLEANSER,

By the use of which stoppages in service and other pipes are freed from naphthaline and other obstructions in a few minutes. PRICE 73s. net.

HULETT'S PATENT MERCURIAL REGULATOR,

For inserting in mains, to prevent the excess of pressure in high ground, or other elevated positions.

PATENTEES OF IMPROVED WET AND DRY GAS-METERS.

Makers of all kinds of Pressure-Gauges, Gaseliers, and every kind of Gas-Fittings for the Trade.

GAS HEATING AND COOKING STOVES.

55 and 56, HIGH HOLBORN, LONDON.

London: Printed by WALTER KING (at the office of Clayton & Co., 17, Bouverie Street, Fleet Street), and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, October 19, 1880.